

Methods in evolutionary ecology WS25/26

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Table of contents

About	4
Quarto	4
How to find your way around	5
 I R	 6
1 First steps	7
1.1 Operators and functions	7
1.2 Data types	10
1.3 Exercises	11
 2 Data structures	 13
2.1 Vectors	13
2.1.1 Exercises	18
2.2 Matrices	18
2.2.1 Exercise	21
2.3 Data frames	21
2.3.1 Exercise	34
 3 Data, packages, and some more functions	 35
3.1 Setting up your working environment	35
3.2 Functions	36
3.3 Loops	37
3.4 Plots	38
3.5 Exercises	40
 4 Tidyverse	 41
4.1 What is the tidyverse?	41
4.2 Our data set for today	42
4.3 <code>filter()</code> for filtering data frames	43
4.4 The pipe <code>%>%</code> for combining commands	56
4.5 Sort by column with <code>arrange()</code>	67
4.6 Select columns with <code>select()</code>	107
4.7 Create new variables with <code>mutate()</code>	169
4.8 Exercise	180

4.9	<code>group_by()</code> and <code>summarise()</code> as powerful data exploration tools	181
4.10	More exercises	182
5	The <code>ggplot2</code> package	183
5.1	Very (!) brief introduction	183
5.2	Building up the plot	183
5.3	Faceting	187
5.4	Some common plot types	189
5.5	Fine tuning plots	193
5.6	Exercise	194
II	UNIX	195
III	Phylogenetics	196
IV	Microbiome	197
	References	198

About

This script covers the computational and bioinformatics parts of the module “Methods in Evolutionary Ecology”. We will introduce you to **R** and **BASH**, two of the most widely used scripting languages, and make you familiar with navigating in a UNIX environment. These skills are important for any biologist, irrespective of the field you may want to specialise in in the future. Building upon your new knowledge, we will learn how to reconstruct phylogenies from sequencing data, how to work with genomic data, and how to characterise microbiomes. At the end of three weeks computational work, you will tackle a small computational group project, putting your new skills into practise.

The script is designed to cover the entire course content. While we will go you through all of the material together in detail during the course, the script should also enable you to work through the content on your own, e.g., to recap after the course has finished and as a reference and starting point for future computational endeavours.

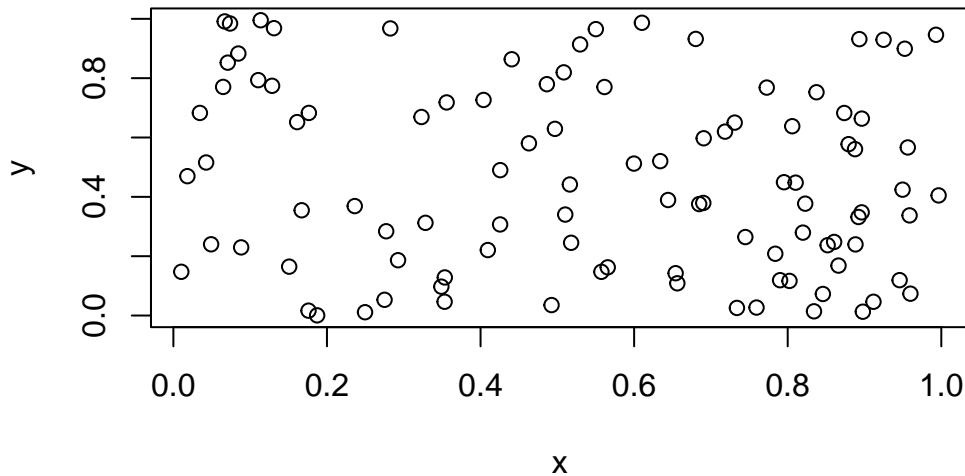
Quarto

The text is formatted using [Quarto](#), which comes with a number of benefits. It allows us to provide explanations as structured and nicely formatted regular text, and to include code blocks for all computational steps. When compiling Quarto documents, all of the code is run, which means that you not only see the code, but also the outputs it creates.

Here is an example:

This little block of **R** code generates 100 random coordinates and plots them. The code is shown below, together with the output the code has produced (in this case, a plot).

```
x <- runif(100)
y <- runif(100)
plot(x, y)
```



The code can conveniently be copied from the block into your own scripts.

Quarto supports many formats, we here provide the script as a webpage and a printable pdf. Writing Quarto documents is very simple and can be done using RStudio as an editor. The entire script is available for you on [github](#) – feel free to download it and modify it with your own comments, notes, and code. We will provide a short introduction to github and Quarto in the course.

How to find your way around

Simply use the navigation on the left to quickly access the different topics, or flip through the individual pages using the buttons at the bottom of the page. You may wish to download the pdf version of the script (click the pdf icon in the top left) which is ideal for printing. The script is organized by topics, rather than course days, because we will adapt the tempo according to your needs.

Please note: The script will very likely only be complete at the end of the course. We will still be modifying and correcting it throughout the three weeks you are with us. So make sure to check out the final version at the end of the course.

Part I

R

1 First steps

R is a statistical programming environment that has become a standard tool in the data and life sciences and many other fields. You may have used R already to run some statistics in a course you took in your studies, and this will be a likely use case for your remaining degree. However, R is much more: it can be used to analyse massive the datasets of the “omics”- age, build webpages, blogs, and interactive apps, and even for art!

Before taking full advantage of what the various R packages have to offer, we need to become familiar with its basic structure and commands. It pays off to invest a little effort in practicing the basics, because all R packages use the same syntax – a solid familiarity with base R thus allows you to explore the entire R universe independently.

1.1 Operators and functions

R can be used just like an arithmetic calculator. You are familiar with all of the basic syntax already, if you know how to use a calculator!

Some examples:

```
3 + 4
```

```
[1] 7
```

```
3 - 4
```

```
[1] -1
```

```
3 * 4
```

```
[1] 12
```

```
3 / 4
```

```
[1] 0.75
```

```
3 ^ 4 # power of
```

```
[1] 81
```

As with a regular calculator, there is operator precedence: power > multiplicative operations > additive operations:

```
(1 + 2) * 3
```

```
[1] 9
```

```
2^3 * 3
```

```
[1] 24
```

```
2^(3 * 3)
```

```
[1] 512
```

Square roots, exponentials, and logarithms also work just as with a calculator:

```
sqrt(9)
```

```
[1] 3
```

```
exp(3)
```

```
[1] 20.08554
```

```
log(3)
```

```
[1] 1.098612
```



```
log(exp(3)) # natural logarithm
```

```
[1] 3
```

```
log10(100) # logarithm to base 10
```

```
[1] 2
```

In order to “save” a value for use later on, you have to assign it to a variable! `<-` is the assignment operator you need to use for this (handy shortcut in RStudio is `ALT + -`).

```
x <- 3 + 4
```

Calling the variable will then print the result to the R console, and can be used in other calculations.

```
x
```

```
[1] 7
```

```
x + 10
```

```
[1] 17
```

You can call your variables whatever you want, but be careful: R will overwrite any variable if you tell it to, without a warning! You should also avoid giving your variables names that are already assigned to functions.

```
my_favourite_variable <- 100  
my_favourite_variable <- 50  
my_favourite_variable
```

```
[1] 50
```

All variables (among other things) are visible in the environment panel in RStudio (default: top right part of the screen).

“=” can also be used to assign variables but is discouraged, because the direction of the assignment is not immediately obvious. It is best practise to always start with the variable, followed by the assignment operator

1.2 Data types

You need to be familiar with at least three important data types in R: **logical**, **numeric**, and **character**. Data being stored in a different data type than required is one of the most frequent error messages you will encounter as an R beginner.

logical simply means true or false. R also understands the abbreviations T and F. To determine which types your data is in, you can use **mode** or **class**.

```
var1 <- TRUE
mode(var1)
```

```
[1] "logical"
```

numeric means numbers

```
var2 <- 10
class(10)
```

```
[1] "numeric"
```

A character is any form of text, a so called “string”. It must always be surrounded by quotation marks!

```
var3 <- "A so called string"
mode(var3)
```

```
[1] "character"
```

If in doubt, R will often convert or read in data as characters. Watch out for some common errors!

```
var4 <- "5"
var4
```

```
[1] "5"
```

```
is.numeric(var4)
```

```
[1] FALSE
```

```
var5 <- "TRUE"  
var5
```

```
[1] "TRUE"
```

```
is.logical(var5)
```

```
[1] FALSE
```

You can convert between types easily!

```
var6 <- as.numeric(var4)  
var6
```

```
[1] 5
```

```
class(var6)
```

```
[1] "numeric"
```

1.3 Exercises

- a) Sum the values of 1 to 5
- b) Create a variable v1 and assign it a character value
- c) Copy variable v1 to v2
- d) Compare the value of v1 against v2

Tip

Compare values and variables using the following operators

<	less than
<=	less than or equal to
>	greater than
>=	greater than or equal to

`==` equals
`!=` not equal

Please note, `=` and `==` do very different things! Don't mix them up.

2 Data structures

So far we've only looked at simple variables consisting of a single value or character. Typically, your data will be more complex. In R, there are three structures relevant for the data you will be working with.

2.1 Vectors

A **vector** is a number of elements of the same data type (`logical`, `numeric`, `character`). It can be generated by concatenating the elements using the function `c`.

```
vec1 <- c(T, F, T, F)
vec1
```

```
[1] TRUE FALSE TRUE FALSE
```

```
mode(vec1)
```

```
[1] "logical"
```

```
vec2 <- c(1, 2, 3, 4, 5)
vec2
```

```
[1] 1 2 3 4 5
```

```
mode(vec2)
```

```
[1] "numeric"
```

```
vec3 <- c("Spring", "Summer", "Autumn", "Winter")
vec3
```

```
[1] "Spring" "Summer" "Autumn" "Winter"
```

```
mode(vec3)
```

```
[1] "character"
```

Other ways to generate vectors are `rep` and `seq`. `rep` is used to repeat any number of elements any number of times.

```
rep(5, 10)
```

```
[1] 5 5 5 5 5 5 5 5 5 5
```

```
rep(vec3, 5)
```

```
[1] "Spring" "Summer" "Autumn" "Winter" "Spring" "Summer" "Autumn" "Winter"
[9] "Spring" "Summer" "Autumn" "Winter" "Spring" "Summer" "Autumn" "Winter"
[17] "Spring" "Summer" "Autumn" "Winter"
```

`seq` can be used to create numerical sequences.

```
seq(from = 0, to = 100, by = 5)
```

```
[1] 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
[20] 95 100
```

The command above is easy to read and understand for humans, which is good. R will also understand if you specify it as

```
seq(0, 100, 5)
```

```
[1] 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
[20] 95 100
```

As a shortcut for a common sequences, you can use

```
1:10
```

```
[1] 1 2 3 4 5 6 7 8 9 10
```

As mentioned above,, vectors can only combine elements of a single data type. Combining multiple different data types may result in some unwanted behaviour.

```
vec_mix1 <- c(5, TRUE, 65)
mode(vec_mix1)
```

```
[1] "numeric"
```

```
vec_mix2 <- c("blue", TRUE, "red")
mode(vec_mix2)
```

```
[1] "character"
```

In many cases you may wish to access a single element of a vector. You can do so using square brackets.

```
z <- c("order", "family", "genus", "species")
z[2]
```

```
[1] "family"
```

Similarly, you can access any combination of elements from the vector.

```
z[1:2]
```

```
[1] "order" "family"
```

```
i <- c(1, 3)
z[i]
```

```
[1] "order" "genus"
```

```
z[c(1, 1, 1, 4)]
```

```
[1] "order" "order" "order" "species"
```

```
z[-1]
```

```
[1] "family" "genus" "species"
```

The square brackets are also used if you need to change elements of the vector. Changes are made using the assignment operator which you already know.

```
x <- 1:5  
x
```

```
[1] 1 2 3 4 5
```

```
x[c(1, 4)] <- 10  
x
```

```
[1] 10 2 3 10 5
```

Which elements of a vector have certain characteristics? This is important for filtering/selecting in your dataset. You can combine different queries using logical operators.

```
x >= 5
```

```
[1] TRUE FALSE FALSE TRUE TRUE
```

```
x[x >= 5]
```

```
[1] 10 10 5
```

```
which(x >= 5)
```

```
[1] 1 4 5
```

```
z
```

```
[1] "order" "family" "genus" "species"
```

```
which(z == "genus")
```

```
[1] 3
```

```
z[z== "genus"]
```

```
[1] "genus"
```



```
z[z != "genus"]
```

```
[1] "order" "family" "species"
```

```
which(z== "genus" | z == "order")
```

```
[1] 1 3
```

Logical operators in R

	OR
&	AND
!	NOT

Conveniently, the elements of a vector can be named and accessed using the names. Let's first create a vector...

```
dmel <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila melanogaster")
dmel
```

```
[1] "Hexapoda"          "Diptera"
[3] "Drosophilidae"     "Drosophila"
[5] "Drosophila melanogaster"
```

... and then add names for each element

```
names(dmel) <- c("Class", "Order", "Family", "Genus", "Species")
dmel
```

	Class	Order	Family
	"Hexapoda"	"Diptera"	"Drosophilidae"
	Genus	Species	
	"Drosophila"	"Drosophila melanogaster"	

```
str(dmel)
```

```
Named chr [1:5] "Hexapoda" "Diptera" "Drosophilidae" "Drosophila" ...
- attr(*, "names")= chr [1:5] "Class" "Order" "Family" "Genus" ...
```

Now we can use the names to access the values

```
dmel[c("Class", "Species")]
```

Class	Species
"Hexapoda"	"Drosophila melanogaster"

```
dmel[names(dmel) == "Order"]
```

Order
"Diptera"

2.1.1 Exercises

- Create a vector consecutively numbering all days of the year 2026. Assign the correct weekday names for all elements of the vector.
- Use the vector to determine how many days in 2026 are weekend days.



Tip

If you struggle to assign the correct names, have a look at the help for `rep`.

2.2 Matrices

A **matrix** in R can be thought of as a two-dimensional vector. All elements must be of the same data type. There are various ways to create a matrix. For example, one can use the `matrix` function like this.

```
mat1 <- matrix(data = 1:12, nrow = 3, ncol = 4, byrow=T)
mat1
```

	[,1]	[,2]	[,3]	[,4]
[1,]	1	2	3	4
[2,]	5	6	7	8
[3,]	9	10	11	12

Alternatively, a vector can be transformed into a matrix

```
mat2 <- 1:12
dim(mat2) <- c(3, 4)
mat2
```

```
      [,1] [,2] [,3] [,4]
[1,]    1    4    7   10
[2,]    2    5    8   11
[3,]    3    6    9   12
```

Often you will want to combine multiple vectors into a matrix

```
dmel <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila melanogaster")
dhyd <- c("Hexapoda", "Diptera", "Drosophilidae", "Drosophila", "Drosophila hydei")
mat3 <- cbind(dmel, dhyd)
mat3
```

```
      dmel                      dhyd
[1,] "Hexapoda"                "Hexapoda"
[2,] "Diptera"                  "Diptera"
[3,] "Drosophilidae"            "Drosophilidae"
[4,] "Drosophila"                "Drosophila"
[5,] "Drosophila melanogaster" "Drosophila hydei"
```

```
mat4 <- rbind(dmel, dhyd)
mat4
```

```
      [,1]      [,2]      [,3]      [,4]
dmel "Hexapoda" "Diptera" "Drosophilidae" "Drosophila"
dhyd "Hexapoda" "Diptera" "Drosophilidae" "Drosophila"
      [,5]
dmel "Drosophila melanogaster"
dhyd "Drosophila hydei"
```

Just like vectors, matrix elements can have names

```
mat3
```

	dmel	dhyd
[1,]	"Hexapoda"	"Hexapoda"
[2,]	"Diptera"	"Diptera"
[3,]	"Drosophilidae"	"Drosophilidae"
[4,]	"Drosophila"	"Drosophila"
[5,]	"Drosophila melanogaster"	"Drosophila hydei"

```
colnames(mat3)
```

```
[1] "dmel" "dhyd"
```

```
rownames(mat3) <- c("Class", "Order", "Family", "Genus", "Species")
mat3
```

	dmel	dhyd
Class	"Hexapoda"	"Hexapoda"
Order	"Diptera"	"Diptera"
Family	"Drosophilidae"	"Drosophilidae"
Genus	"Drosophila"	"Drosophila"
Species	"Drosophila melanogaster"	"Drosophila hydei"

And just like with vectors, we can use square brackets to access and replace values. Because there are 2 dimensions, we need to provide 2 values (one for rows, one for columns, separated by ,).

```
mat3
```

	dmel	dhyd
Class	"Hexapoda"	"Hexapoda"
Order	"Diptera"	"Diptera"
Family	"Drosophilidae"	"Drosophilidae"
Genus	"Drosophila"	"Drosophila"
Species	"Drosophila melanogaster"	"Drosophila hydei"

```
mat3[1:3, 2]
```

Class	Order	Family
"Hexapoda"	"Diptera"	"Drosophilidae"

```
mat3[1:3, ]
```

	dmel	dhyd
Class	"Hexapoda"	"Hexapoda"
Order	"Diptera"	"Diptera"
Family	"Drosophilidae"	"Drosophilidae"

```
mat3[c("Class", "Species"), ]
```

	dmel	dhyd
Class	"Hexapoda"	"Hexapoda"
Species	"Drosophila melanogaster"	"Drosophila hydei"

2.2.1 Exercise

- create a matrix using with 20 rows & 5 columns, using 100 randomly generated numbers between 0 and 1000.
- replace all values in the 3rd column of this matrix that are larger than 500 with NA.



Tip

use the function `runif` to create random values

2.3 Data frames

Data frames are the R equivalent of spread sheets. Like matrices, they are two-dimensional, however they may combine different data types. Most biological data sets you will encounter will be data frames.

Lets create a data frame

```
# create some data
species <- rep(c("beech","ash","elm","maple", "sycamore"),40)
species
```

```

[1] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[7] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[13] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[19] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[25] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[31] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[37] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[43] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[49] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[55] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[61] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[67] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[73] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[79] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[85] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[91] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[97] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[103] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[109] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[115] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[121] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[127] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[133] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[139] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[145] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[151] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[157] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[163] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[169] "maple"      "sycamore" "beech"    "ash"      "elm"      "maple"
[175] "sycamore"   "beech"    "ash"      "elm"      "maple"    "sycamore"
[181] "beech"      "ash"      "elm"      "maple"    "sycamore" "beech"
[187] "ash"        "elm"      "maple"    "sycamore" "beech"    "ash"
[193] "elm"        "maple"    "sycamore" "beech"    "ash"      "elm"
[199] "maple"      "sycamore"

```

```

dbh <- runif(200, 5, 40)
dbh

```

```

[1] 38.239738  9.924978 17.644875 14.758204  8.112560 29.161929 16.408917
[8] 30.389340 36.811078 31.191832 26.100697 28.994153 15.794508  9.397184
[15]  7.139759 13.537836 33.884461 10.692155 34.798962 34.501117 28.579566
[22] 21.177560 23.917351 39.880807 27.950958 36.732777 15.247940 36.600617

```

```

[29] 19.305274 26.771420 13.752069 33.674395 32.734179 29.397947 11.075603
[36] 36.501396 28.527876 19.612890 16.150932 29.389700 7.459637 28.534702
[43] 8.844074 31.530905 22.487550 33.683751 38.723382 37.200933 19.438794
[50] 32.334199 22.896106 11.278162 19.905561 36.976410 22.317597 8.563427
[57] 6.068512 6.810943 19.327362 28.448578 14.736160 23.919365 16.777181
[64] 27.843053 24.216611 19.248359 24.971290 14.006655 38.808197 20.043772
[71] 14.682609 22.777296 7.915799 35.470322 36.240725 28.296330 36.054309
[78] 30.977352 23.432400 17.436857 31.418613 12.329011 37.500111 26.320449
[85] 12.995927 13.544057 35.773329 25.936598 25.210073 10.938406 18.988372
[92] 5.059609 18.188714 38.759800 7.012663 9.735761 5.667514 19.634067
[99] 32.314191 35.438598 17.415070 13.045285 11.272067 13.455413 15.518563
[106] 36.457562 26.999895 26.434268 27.595379 5.651569 19.954715 25.391282
[113] 17.834598 31.529992 5.801635 9.335943 18.875939 26.731617 32.042606
[120] 16.863646 12.604389 27.513241 29.096912 24.301473 24.609366 21.570541
[127] 22.987732 33.968343 8.747367 22.889121 11.322719 39.453168 37.609234
[134] 14.442752 11.988907 19.608425 19.978634 27.265251 12.977538 15.308206
[141] 21.588926 11.492158 22.860099 33.628508 7.384447 31.853492 13.137376
[148] 18.633635 7.900141 10.807906 35.871754 27.873271 37.920963 31.794441
[155] 32.383581 25.047851 31.856438 36.234218 9.322297 33.903232 24.786987
[162] 13.983615 17.394771 11.563573 6.209073 26.235443 26.523341 23.660932
[169] 21.326744 15.546398 31.854089 29.414891 5.062756 17.803043 11.326971
[176] 23.053015 29.098560 22.909062 29.493071 31.076845 31.636655 23.584659
[183] 35.469877 17.404010 26.857894 24.518407 14.645725 25.040450 19.314150
[190] 6.125705 12.990836 13.847055 10.878030 15.150384 30.117026 10.457404
[197] 23.052005 28.732790 8.383497 6.462141

```

```

age <- as.integer(runif(200, 20, 120))
age

```

```

[1] 98 32 96 101 44 84 78 109 41 33 78 60 73 91 38 32 101 94
[19] 86 31 113 66 76 23 20 97 91 23 87 41 73 107 72 63 80 30
[37] 85 116 61 117 30 110 63 57 73 76 59 48 41 34 83 63 41 36
[55] 101 71 78 52 42 28 104 68 94 43 29 41 62 61 46 74 29 30
[73] 33 98 54 63 85 80 114 84 111 92 58 39 85 88 105 111 119 88
[91] 86 112 33 44 37 29 40 65 66 97 39 106 54 80 69 93 25 54
[109] 87 87 92 79 68 105 86 91 43 79 26 98 49 94 90 113 35 88
[127] 76 50 33 45 78 104 54 96 64 112 115 20 33 83 103 106 93 41
[145] 24 82 80 95 71 94 61 66 37 69 114 74 88 69 55 68 43 108
[163] 62 76 53 83 113 49 69 101 80 88 98 76 72 46 81 49 37 73
[181] 53 40 31 26 114 57 68 92 112 78 105 37 51 62 116 23 114 48
[199] 100 61

```

```
df1 <- data.frame(species, dbh, age)
df1
```

species	dbh	age
beech	38.239738	98
ash	9.924978	32
elm	17.644875	96
maple	14.758204	101
sycamore	8.112560	44
beech	29.161929	84
ash	16.408917	78
elm	30.389340	109
maple	36.811078	41
sycamore	31.191832	33
beech	26.100697	78
ash	28.994152	60
elm	15.794508	73
maple	9.397184	91
sycamore	7.139759	38
beech	13.537836	32
ash	33.884461	101
elm	10.692155	94
maple	34.798962	86
sycamore	34.501117	31
beech	28.579566	113
ash	21.177560	66
elm	23.917351	76
maple	39.880807	23
sycamore	27.950958	20
beech	36.732777	97
ash	15.247940	91
elm	36.600617	23
maple	19.305274	87
sycamore	26.771420	41
beech	13.752069	73
ash	33.674395	107
elm	32.734179	72
maple	29.397947	63
sycamore	11.075603	80
beech	36.501396	30
ash	28.527876	85

species	dbh	age
elm	19.612890	116
maple	16.150931	61
sycamore	29.389700	117
beech	7.459637	30
ash	28.534702	110
elm	8.844074	63
maple	31.530905	57
sycamore	22.487550	73
beech	33.683751	76
ash	38.723382	59
elm	37.200933	48
maple	19.438794	41
sycamore	32.334199	34
beech	22.896106	83
ash	11.278162	63
elm	19.905561	41
maple	36.976410	36
sycamore	22.317597	101
beech	8.563427	71
ash	6.068512	78
elm	6.810943	52
maple	19.327362	42
sycamore	28.448578	28
beech	14.736160	104
ash	23.919365	68
elm	16.777182	94
maple	27.843053	43
sycamore	24.216611	29
beech	19.248359	41
ash	24.971290	62
elm	14.006655	61
maple	38.808197	46
sycamore	20.043772	74
beech	14.682609	29
ash	22.777296	30
elm	7.915799	33
maple	35.470322	98
sycamore	36.240725	54
beech	28.296330	63
ash	36.054309	85
elm	30.977352	80

species	dbh	age
maple	23.432400	114
sycamore	17.436857	84
beech	31.418613	111
ash	12.329011	92
elm	37.500111	58
maple	26.320449	39
sycamore	12.995927	85
beech	13.544057	88
ash	35.773329	105
elm	25.936598	111
maple	25.210073	119
sycamore	10.938406	88
beech	18.988372	86
ash	5.059609	112
elm	18.188714	33
maple	38.759800	44
sycamore	7.012663	37
beech	9.735760	29
ash	5.667514	40
elm	19.634067	65
maple	32.314191	66
sycamore	35.438598	97
beech	17.415070	39
ash	13.045285	106
elm	11.272067	54
maple	13.455413	80
sycamore	15.518563	69
beech	36.457562	93
ash	26.999894	25
elm	26.434268	54
maple	27.595379	87
sycamore	5.651569	87
beech	19.954715	92
ash	25.391282	79
elm	17.834598	68
maple	31.529992	105
sycamore	5.801635	86
beech	9.335943	91
ash	18.875939	43
elm	26.731617	79
maple	32.042606	26

species	dbh	age
sycamore	16.863646	98
beech	12.604389	49
ash	27.513241	94
elm	29.096912	90
maple	24.301472	113
sycamore	24.609366	35
beech	21.570541	88
ash	22.987732	76
elm	33.968343	50
maple	8.747367	33
sycamore	22.889121	45
beech	11.322719	78
ash	39.453168	104
elm	37.609234	54
maple	14.442752	96
sycamore	11.988907	64
beech	19.608425	112
ash	19.978634	115
elm	27.265251	20
maple	12.977538	33
sycamore	15.308206	83
beech	21.588926	103
ash	11.492158	106
elm	22.860099	93
maple	33.628508	41
sycamore	7.384447	24
beech	31.853492	82
ash	13.137375	80
elm	18.633635	95
maple	7.900141	71
sycamore	10.807906	94
beech	35.871754	61
ash	27.873271	66
elm	37.920963	37
maple	31.794441	69
sycamore	32.383581	114
beech	25.047851	74
ash	31.856438	88
elm	36.234218	69
maple	9.322297	55
sycamore	33.903232	68

species	dbh	age
beech	24.786987	43
ash	13.983615	108
elm	17.394771	62
maple	11.563573	76
sycamore	6.209073	53
beech	26.235443	83
ash	26.523341	113
elm	23.660932	49
maple	21.326744	69
sycamore	15.546397	101
beech	31.854089	80
ash	29.414891	88
elm	5.062756	98
maple	17.803043	76
sycamore	11.326971	72
beech	23.053015	46
ash	29.098561	81
elm	22.909062	49
maple	29.493071	37
sycamore	31.076846	73
beech	31.636654	53
ash	23.584659	40
elm	35.469877	31
maple	17.404010	26
sycamore	26.857894	114
beech	24.518407	57
ash	14.645725	68
elm	25.040450	92
maple	19.314150	112
sycamore	6.125705	78
beech	12.990836	105
ash	13.847055	37
elm	10.878030	51
maple	15.150384	62
sycamore	30.117026	116
beech	10.457404	23
ash	23.052005	114
elm	28.732790	48
maple	8.383497	100
sycamore	6.462141	61

To access values, we can use the same approaches as for matrices:

```
df1[1:12, 1:2]
```

species	dbh
beech	38.239738
ash	9.924978
elm	17.644875
maple	14.758204
sycamore	8.112560
beech	29.161929
ash	16.408917
elm	30.389340
maple	36.811078
sycamore	31.191832
beech	26.100697
ash	28.994152

but can also access and filter the columns directly using their names like this:

```
df1$species
```

```
[1] "beech"  "ash"    "elm"    "maple"  "sycamore" "beech"
[7] "ash"    "elm"    "maple"  "sycamore" "beech"  "ash"
[13] "elm"    "maple"  "sycamore" "beech"  "ash"    "elm"
[19] "maple"  "sycamore" "beech"  "ash"    "elm"    "maple"
[25] "sycamore" "beech"  "ash"    "elm"    "maple"  "sycamore"
[31] "beech"  "ash"    "elm"    "maple"  "sycamore" "beech"
[37] "ash"    "elm"    "maple"  "sycamore" "beech"  "ash"
[43] "elm"    "maple"  "sycamore" "beech"  "ash"    "elm"
[49] "maple"  "sycamore" "beech"  "ash"    "elm"    "maple"
[55] "sycamore" "beech"  "ash"    "elm"    "maple"  "sycamore"
[61] "beech"  "ash"    "elm"    "maple"  "sycamore" "beech"
[67] "ash"    "elm"    "maple"  "sycamore" "beech"  "ash"
[73] "elm"    "maple"  "sycamore" "beech"  "ash"    "elm"
[79] "maple"  "sycamore" "beech"  "ash"    "elm"    "maple"
[85] "sycamore" "beech"  "ash"    "elm"    "maple"  "sycamore"
[91] "beech"  "ash"    "elm"    "maple"  "sycamore" "beech"
[97] "ash"    "elm"    "maple"  "sycamore" "beech"  "ash"
[103] "elm"    "maple"  "sycamore" "beech"  "ash"    "elm"
```

```

[109] "maple"      "sycamore" "beech"     "ash"       "elm"       "maple"
[115] "sycamore"   "beech"     "ash"       "elm"       "maple"     "sycamore"
[121] "beech"      "ash"       "elm"       "maple"     "sycamore"   "beech"
[127] "ash"        "elm"       "maple"     "sycamore"   "beech"     "ash"
[133] "elm"        "maple"     "sycamore"   "beech"     "ash"       "elm"
[139] "maple"      "sycamore"   "beech"     "ash"       "elm"       "maple"
[145] "sycamore"   "beech"     "ash"       "elm"       "maple"     "sycamore"
[151] "beech"      "ash"       "elm"       "maple"     "sycamore"   "beech"
[157] "ash"        "elm"       "maple"     "sycamore"   "beech"     "ash"
[163] "elm"        "maple"     "sycamore"   "beech"     "ash"       "elm"
[169] "maple"      "sycamore"   "beech"     "ash"       "elm"       "maple"
[175] "sycamore"   "beech"     "ash"       "elm"       "maple"     "sycamore"
[181] "beech"      "ash"       "elm"       "maple"     "sycamore"   "beech"
[187] "ash"        "elm"       "maple"     "sycamore"   "beech"     "ash"
[193] "elm"        "maple"     "sycamore"   "beech"     "ash"       "elm"
[199] "maple"      "sycamore"

```

```
df1[df1$dbh > 15, ]
```

	species	dbh	age
1	beech	38.23974	98
3	elm	17.64487	96
6	beech	29.16193	84
7	ash	16.40892	78
8	elm	30.38934	109
9	maple	36.81108	41
10	sycamore	31.19183	33
11	beech	26.10070	78
12	ash	28.99415	60
13	elm	15.79451	73
17	ash	33.88446	101
19	maple	34.79896	86
20	sycamore	34.50112	31
21	beech	28.57957	113
22	ash	21.17756	66
23	elm	23.91735	76
24	maple	39.88081	23
25	sycamore	27.95096	20
26	beech	36.73278	97
27	ash	15.24794	91
28	elm	36.60062	23

	species	dbh	age
29	maple	19.30527	87
30	sycamore	26.77142	41
32	ash	33.67440	107
33	elm	32.73418	72
34	maple	29.39795	63
36	beech	36.50140	30
37	ash	28.52788	85
38	elm	19.61289	116
39	maple	16.15093	61
40	sycamore	29.38970	117
42	ash	28.53470	110
44	maple	31.53091	57
45	sycamore	22.48755	73
46	beech	33.68375	76
47	ash	38.72338	59
48	elm	37.20093	48
49	maple	19.43879	41
50	sycamore	32.33420	34
51	beech	22.89611	83
53	elm	19.90556	41
54	maple	36.97641	36
55	sycamore	22.31760	101
59	maple	19.32736	42
60	sycamore	28.44858	28
62	ash	23.91936	68
63	elm	16.77718	94
64	maple	27.84305	43
65	sycamore	24.21661	29
66	beech	19.24836	41
67	ash	24.97129	62
69	maple	38.80820	46
70	sycamore	20.04377	74
72	ash	22.77730	30
74	maple	35.47032	98
75	sycamore	36.24073	54
76	beech	28.29633	63
77	ash	36.05431	85
78	elm	30.97735	80
79	maple	23.43240	114
80	sycamore	17.43686	84
81	beech	31.41861	111

	species	dbh	age
83	elm	37.50011	58
84	maple	26.32045	39
87	ash	35.77333	105
88	elm	25.93660	111
89	maple	25.21007	119
91	beech	18.98837	86
93	elm	18.18871	33
94	maple	38.75980	44
98	elm	19.63407	65
99	maple	32.31419	66
100	sycamore	35.43860	97
101	beech	17.41507	39
105	sycamore	15.51856	69
106	beech	36.45756	93
107	ash	26.99989	25
108	elm	26.43427	54
109	maple	27.59538	87
111	beech	19.95471	92
112	ash	25.39128	79
113	elm	17.83460	68
114	maple	31.52999	105
117	ash	18.87594	43
118	elm	26.73162	79
119	maple	32.04261	26
120	sycamore	16.86365	98
122	ash	27.51324	94
123	elm	29.09691	90
124	maple	24.30147	113
125	sycamore	24.60937	35
126	beech	21.57054	88
127	ash	22.98773	76
128	elm	33.96834	50
130	sycamore	22.88912	45
132	ash	39.45317	104
133	elm	37.60923	54
136	beech	19.60842	112
137	ash	19.97863	115
138	elm	27.26525	20
140	sycamore	15.30821	83
141	beech	21.58893	103
143	elm	22.86010	93

	species	dbh	age
144	maple	33.62851	41
146	beech	31.85349	82
148	elm	18.63364	95
151	beech	35.87175	61
152	ash	27.87327	66
153	elm	37.92096	37
154	maple	31.79444	69
155	sycamore	32.38358	114
156	beech	25.04785	74
157	ash	31.85644	88
158	elm	36.23422	69
160	sycamore	33.90323	68
161	beech	24.78699	43
163	elm	17.39477	62
166	beech	26.23544	83
167	ash	26.52334	113
168	elm	23.66093	49
169	maple	21.32674	69
170	sycamore	15.54640	101
171	beech	31.85409	80
172	ash	29.41489	88
174	maple	17.80304	76
176	beech	23.05301	46
177	ash	29.09856	81
178	elm	22.90906	49
179	maple	29.49307	37
180	sycamore	31.07685	73
181	beech	31.63665	53
182	ash	23.58466	40
183	elm	35.46988	31
184	maple	17.40401	26
185	sycamore	26.85789	114
186	beech	24.51841	57
188	elm	25.04045	92
189	maple	19.31415	112
194	maple	15.15038	62
195	sycamore	30.11703	116
197	ash	23.05200	114
198	elm	28.73279	48

2.3.1 Exercise

- a) Using `df1`, select only entries corresponding to ash and maple with an age over 50 and a diameter less than 30.
- b) Add a new column to the dataframe called “year”. Generate data for this column so that there are 10 different years and the same number of entries for each tree species per year.

Tip

Use the function `rep` for this exercise

3 Data, packages, and some more functions

3.1 Setting up your working environment

Usually when working in **R**, you want to look at your own data, and not generate it from random distributions. To read in a data file, we first need to tell **R** where the working directory is located.

```
setwd("/home/of22haqi/Documents/TEACHING/MEE-WS25-26/")
```

The path will look different on your machine of course.

Now that `R` knows where to find it, we are ready to read in a data file.

```
# The table contains headers, and the fields are separated by commas
be <- read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# Let's have a glimpse at the data
head(be)
```

[illegible]

[illegible]

In order to save your entire working environment, so you don't have to re-run potentially time intensive pieces of your code, just save it and load it back into your work space the next time you use R.

You can also use the panel “Environment” in RStudio to save and load your data.

```
install.packages("tidyverse", dependencies = TRUE)
```

3.2 Functions

```
mean(be$range.size, na.rm = TRUE)
```

```
[1] 261.4116
```

`mean` is the function, `be$range.size` is the object (1 vector from the dataframe we just read into R) and `na.rm = TRUE` is the option to remove NAs from the vector before calculating the mean.

In some cases, you may want to do things to your data that cannot be addressed by a single function. In this case, you may have to perform a number of different operations on the dataset. If you are likely to use the same set of operations in the future, it may be advisable to use your own functions.

A very simple example. Let's assume the mean function didn't exist and we would need to write our own.

```
mean2 <- function(x){  
  x <- na.omit(x)  
  sum(x) / length(x)  
}  
  
mean2(be$range.size)
```

```
[1] 261.4116
```

We define `mean2` as a function that requires an object (here called `x` as an input). Looking into the function, we can see that it first removes the NAs from the object and next calculates the sum of `x` divided by the number of elements of `x` (this is how the mean is defined). Testing it, we can see that it gives the same result as the native mean function.

3.3 Loops

In many cases, we need to apply a function to a number of elements. In this case, loops come in handy. In the simple examples below, the structure of a for loop is illustrated.

```
for(i in 1:10) # how often is the loop repeated  
{  
  print(i)    # what is to be done each iteration  
}
```

```
[1] 1
[1] 2
[1] 3
[1] 4
[1] 5
[1] 6
[1] 7
[1] 8
[1] 9
[1] 10
```

```
j<-0
for(i in 1:5)
{
  j<-i+j
  print(j)
}
```

```
[1] 1
[1] 3
[1] 6
[1] 10
[1] 15
```

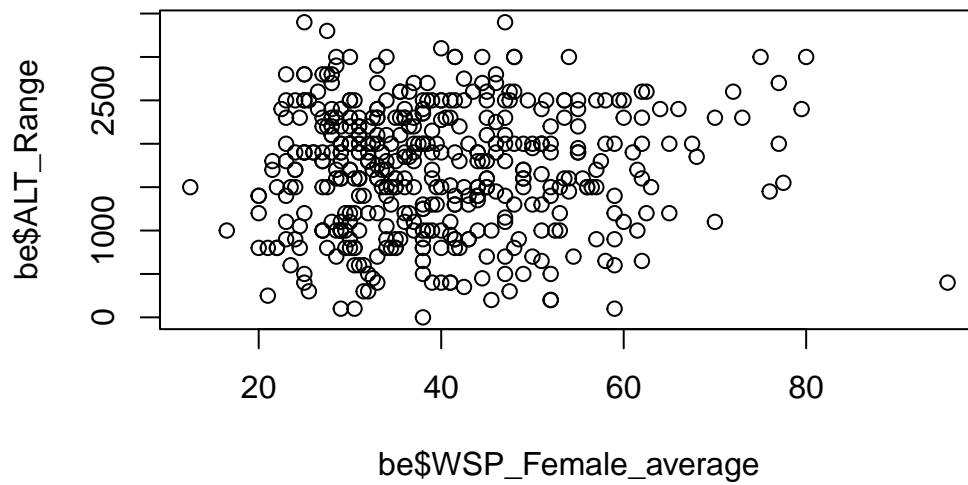
Observe and try to explain what happens in each iteration to the variables used in these examples.

3.4 Plots

For many use cases `ggplot2` is the best approach of plotting, and we will get to know this package later. However, for very simple and quick plots, base R plotting functions are sufficient and superior to other options because of simplicity and speed.

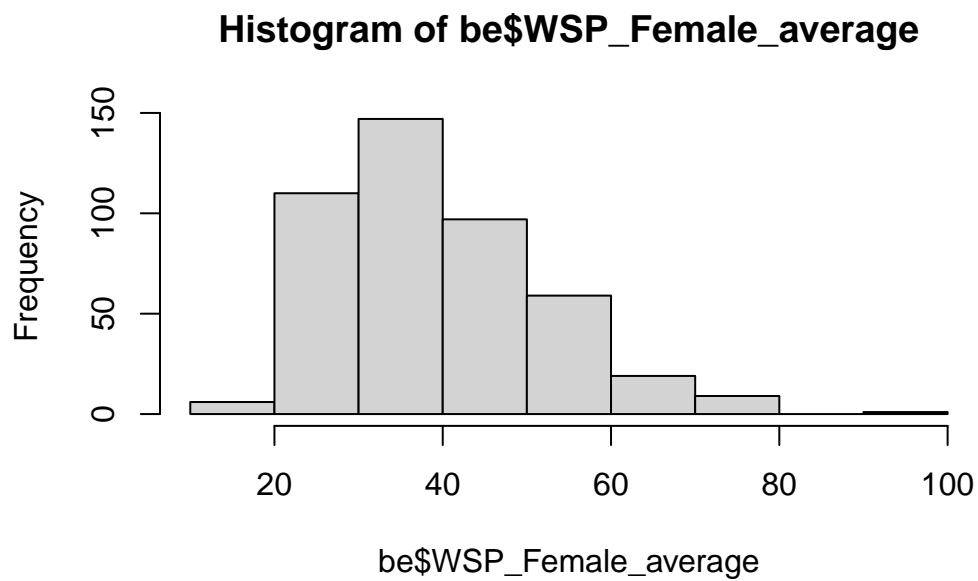
Scatter plots can be created by just naming the variables to be plotted against each other.

```
plot(be$WSP_Female_average, be$ALT_Range)
```



Histograms showing frequency distributions are also very easily generated

```
hist(be$WSP_Female_average)
```



3.5 Exercises

- a) Using a loop, plot histograms for the columns “WSP_Female_average”, “Alt_Range”, “Alt_min”, and “range.size”.
- b) Write a function that creates these plots with only the dataframe as argument.

4 Tidyverse

4.1 What is the tidyverse?

- A collection of R packages for data science
- All packages share a “philosophy” about design and data structure
- All packages are highly compatible and functions complement each other

We will only be looking at a couple of functions from a 2 packages (`dplyr` & `ggplot2`). All functions are about **data manipulation and visualisation** and are especially well suited for exploring very large data sets.

You can install all tidyverse packages by running

```
install.packages("tidyverse", dependencies = TRUE)
```

The following package(s) will be installed:

- tidyverse [2.0.0]

These packages will be installed into "~/work/MEE-WS25-26/MEE-WS25-26/renv/library/R-4.2/x86_64-pc-linux-gnu".

```
# Installing packages -----
- Installing tidyverse ...           OK [linked from cache]
Successfully installed 1 package in 5.5 milliseconds.
```

Let's refresh what we learned earlier this week:

1. What different types of data structures are used in R?
2. Which of these do you think is most likely to be used in the `tidyverse`?

(Remember, you can just add the answers into this document for future reference!)

4.2 Our data set for today

We will be looking at a data set of ecological traits of european butterflies. Download the table and read it into R.

```
# The table contains headers, and the fields are separated by commas
be <- read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# Let's have a glimpse at the data
head(be)
```

[illegible]

Each of the rows contains data for 1 European species, and the columns contain the following information:

Trait abbreviation	Meaning	States	Notes
OWS	Overwintering stage	egg, larvae, pupae, adult	
GEN	Generations	average, min, max, range	
WSP	Wingspan	average, range	Measured in mm
HSI	Hostplant index	N/A	Measured from 0-1
LEV	Larval environment	buried, ground layer, field layer, shrub layer, canopy layer	
ELT	Egg laying type	single, small batch, large batch	
ALT	Altitude	min, range	
FM	Flight months	average, range	
AFB	Adult feeding behaviour	herb flower, grass, shrub flower, honeydew, sap, animal, mineral	

Now that we are familiar with the dataset, lets look at some `tidyverse` functions.

4.3 filter() for filtering data frames

As the name suggests, this is used to filter data frames, with a simple and efficient syntax:

```
# first, we have to load the tidyverse packages
library(tidyverse, quietly = TRUE)

# the command always takes a dataframe as first argument, and a filtering criterion as second
# Here, we only look butterflies that overwinter as eggs
filter(be, OWS_egg == 1)
```

[illegible]

[illegible]

[illegible]

		WSP_Fe-																											
con-	fam-	serv-	con-	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS	OWS								
size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range								
spec-	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range	size	range								
caen-	hidae	pothoe	draca-	hididae	bi-	cans	draca-	conidae	don	draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae									
LyLy689	4	1	1	0	0	1.00	0.01	0.00	0.30	5	0.28	91	1	0	0	1	0	0	0	2500	51	1	0	0	0	0	0	0	0
caen-	hidae	pothoe	draca-	hididae	bi-	cans	draca-	conidae	don	draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae									
LyLy405	5	5	1	0	0	0	1.00	0.01	0.00	0.39	6	1.00	00	1	0	0	NANANA	500	100	000	1	0	0	0	0	0	0	1	
draca-	hididae	bi-	cans	draca-	conidae	don	draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae									
LyLy575	4	1	0	0	0	1.50	0.02	0.01	0.33	6	1.00	01	0	0	0	1	0	0	100	240	000	1	0	0	0	0	1	1	
draca-	conidae	don	draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
LyLy505	5	5	1	0	0	0	2.00	0.02	0.00	0.34	4	1.00	00	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
LyLy885	5	5	1	0	0	0	1.00	0.01	0.00	0.34	9	0.57	71	1	0	0	1	0	0	0	200	002	1	0	0	0	0	0	1
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
ParLy415	1	1	1	3.00	0.03	0.00	0.45	3	0.10	21	1	0	0	1	0	0	0	100	12.0	0	0	1	1	1	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
ParLy415	1	1	1	3.00	0.03	0.00	0.37	5	0.10	21	1	0	0	1	0	0	0	200	12.0	0	0	1	1	1	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
ParPa354	4	1	1	0	0	1.00	0.01	0.00	0.80	00	0.20	41	0	0	0	1	1	0	0	300	051	1	0	0	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
ParPa374	5	1	0	0	0	1.00	0.01	0.00	0.58	02	0.35	41	0	0	0	1	0	0	0	250	000	1	0	0	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
ParPa484	4	1	1	0	0	1.00	0.01	0.00	0.65	00	0.16	81	1	0	0	1	0	0	160	120	000	1	0	0	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							
PiePie42	1	1	1	3.00	0.03	0.00	0.62	5	0.28	91	1	1	0	0	1	1	200	120	12.0	1	0	0	0	0	0	0	0	0	
draca-	hididae	pana	Mul-	draca-	hididae	peri-	idae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae	Par-	draca-	hididae							

[illegible]

[illegible]

[illegible]

[illegible]

	con-	GEN_Av-	WSP_Fe-	FM_Av-	AFB_AFB_an-																								
fam- serv- con- OWS_Sap- GEN_Av- male_av- er-WSP_Fe- ELT_sin- er- ey- i- AFB_min-	species	range	size	OWS_pac	OWS_Gen	CAN_Hag	HAG_Hag	NIN_Hag	MUS_Hag	ELT_Hag	FEH_Hag	THM_Hag	AFB_Hag	AFB_min	power														
Ly-Ly685	4	1	1	0	0	1.00	0.01	0.00	0.30	7	0.289	1	1	0	0	1	0	0	0	2500	051	1	0	0	0	0	0	0	
caeceniidae																													
pothoe																													
Ly-Ly405	5	1	0	0	0	1.00	0.01	0.00	0.39	6	1.000	0	1	0	0	NANA	NANA	500	1000	3000	1	0	0	0	0	0	0	1	
dracaenidae																													
bi-																													
cans																													
Ly-Ly575	4	1	0	0	0	1.50	0.02	0.01	0.33	6	1.000	1	0	0	0	1	0	0	100	2400	3000	1	0	0	0	0	0	1	1
dracaenidae																													
don																													
Ly-Ly505	5	1	0	0	0	2.00	0.02	0.00	0.34	4	1.000	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1	
dracaenidae																													
pana																													
Mus-Mus5pi5_proto	0	0	1.00	0.01	0.00	0.34	5	0.507	7	1	1	0	0	0	1	0	0	0	200	400	2	1	0	0	0	0	0	1	
peri-																													
idae																													
Ny-Ny015	5	0	0	0	1	1.25	0.01	0.50	0.67	5	0.192	0	0	1	1	0	0	1	0	200	50	57	1	0	1	1	1	1	
tiopa																													
dae																													
Pan-PanNA	Phia	1	1	1	3.00	0.03	0.00	0.45	3	0.102	1	1	0	0	1	0	0	0	100	12.0	0	0	0	1	1	1	0	0	
i-																													
dae																													
Pan-PanNA	hibides	1	1	3.00	0.03	0.00	0.37	5	0.102	1	1	0	0	1	0	0	0	0	200	12.0	0	0	0	1	1	1	0	0	
i-																													
dae																													
Pa-Pa354	4	1	1	0	0	1.00	0.01	0.00	0.80																				

	con- fam- ser- con- size- OWS- OWS- size- OWS- size- WSP_Fe- GEN_Av- male_av- er-WSP_Fe- ELT_sin- FM_Av- er- AFB_Av- ey- i- AFB_min- AFB_max- AFB- power																													
Pleuromedon thidae	1	1	1	3.00	0.03	0.00	0.62	5.0	0.28	91	1	1	0	0	1	1	200	120	2.0	1	0	0	0	0	0	0	0			
Pleuropharyngus be-caenidae	5	5	1	0	0	0	1.50	0.02	0.01	0.22	5.0	0.06	91	1	0	0	1	0	0	0	240	400	0	1	0	0	0	0	1	1
jus_ar-gus																														
Pleuropharyngus be-caenidae	5	5	1	1	0	0	1.50	0.02	0.01	0.31	6.0	0.22	40	1	0	0	1	0	0	0	300	1400	0	1	0	0	0	0	0	0
jus_ar-gy-rog-nomon																														
Pleuropharyngus be-caenidae	5	5	1	0	0	0	1.50	0.02	0.01	0.24	5.0	0.04	10	1	0	0	1	0	0	0	100	2300	0	1	0	0	0	0	0	0
jus_idas																														
Polydora niadæ	5	5	0	0	0	1	2.00	0.03	0.02	0.46	0.02	0.05	00	1	1	1	1	0	0	0	270	6057	1	0	1	1	1	1	1	
album																														
Polydora caenidae	4	4	1	1	0	0	1.00	0.01	0.00	0.32	4.0	0.41	71	0	0	0	1	0	0	0	600	1800	0	1	0	0	0	0	0	1
tus_damon																														
Polydora caenidae	5	5	1	0	0	0	1.00	0.01	0.00	0.35	6.0	0.12	91	1	0	0	1	0	0	0	200	1800	0	1	0	0	0	0	0	1
tus_daph-nis																														
Polydora caenidae	3	3	3	0	1	0	0	1.00	0.01	0.00	0.31	6.0	1.00	00	1	0	0	NAN	NAN	1	200	2000	2.00	1	0	0	1	0	0	1
tus_violetae																														
Pyrosoma siiiidae	3	3	1	1	0	0	1.00	0.01	0.00	0.27	2.0	0.40	81	1	0	0	1	0	0	0	100	3002	1	0	0	0	0	0	0	1
Saturniidae	5	5	1	0	0	0	1.00	0.01	0.00	0.30	4.0	1.00	01	0	1	0	1	0	0	0	200	3002	1	0	1	0	0	0	0	0

Species	Genus	Family	Size	OVS	SV	Spu	WSP_Fe-		ELT_sin-	FM_Av-	AFB_AFB_an-		AFB_min-	power																
							con-	con-			ey-	i-																		
Satyridae	Ly-106	5	1	0	0	0	1.00	0.01	0.00	0.32	0.0	0.70	0	1	1	1	0	0	100	1200	0	0	0	0						
Satyridae	Ly-158	5	1	0	0	0	1.00	0.01	0.00	0.34	0.0	0.10	20	0	1	0	1	0	0	0	1800	0	0	1	0	0	0	0		
Satyridae	Ly-110	5	1	0	0	0	1.00	0.01	0.00	0.29	0.0	0.57	70	0	1	0	1	0	0	600	1900	0	0	0	0	0	0			
Satyridae	Ly-108	5	1	0	0	0	1.00	0.01	0.00	0.31	0.0	0.13	40	0	1	0	1	0	0	100	600	0	0	1	1	0	0	0		
Satyridae	Ly-185	5	1	0	0	0	1.00	0.01	0.00	0.30	0.0	0.16	70	0	1	0	1	1	0	0	200	300	0	0	1	1	0	0	0	
Satyridae	Ly-155	5	1	0	0	0	1.00	0.01	0.00	0.30	0.0	0.06	50	0	1	1	1	0	0	0	1700	0	0	1	0	0	0	0		
Speyridae	Ly-113	5	1	1	0	0	1.00	0.01	0.00	0.51	0.0	0.50	00	1	1	0	0	1	0	0	0	2500	0	0	0	0	0	1	1	
Thyridae	Ly-625	5	1	0	0	0	1.00	0.01	0.00	0.35	0.0	0.12	90	0	1	0	1	0	0	0	1600	0	0	1	0	0	0	0		
Thyridae	Ly-925	5	1	0	0	0	1.00	0.01	0.00	0.25	0.0	0.06	70	1	0	0	0	1	1	0	2500	0	0	0	0	0	0	1		
Vandykeidae	Ly-13	5	1	0	0	0	2.00	0.03	0.02	0.59	0.13	0.30	60	1	0	0	1	0	0	0	2500	0	0	1	0	1	1	1	1	
Vandykeidae	Ly-13	5	1	0	0	0	2.00	0.03	0.02	0.54	0.06	0.08	30	1	0	0	1	0	0	0	3000	0	0	1	0	1	1	0	0	0
Vandykeidae	Ly-13	5	1	1	1	1	3.00	0.03	0.00	0.57	0.0	0.28	90	1	0	0	1	0	0	0	1500	0	0	1	0	0	0	0	0	0
Zizyria	Ly-NAN	Al	1	1	1	1	3.00	0.03	0.00	0.22	0.0	0.28	90	NAN	NAN	NAN	NAN	NAN	NAN	0	1500	0	NAN	NAN	NAN	NAN	NAN	NAN	NAN	
Zizyria	Ly-39	NAN	Al	1	1	1	3.00	0.03	0.00	0.22	0.0	0.15	90	NAN	NAN	NAN	NAN	NAN	NAN	0	800	0	0	1	0	0	0	0	0	1

`filter()` (and many other `tidyverse` functions) return a data frame. In the `tidyverse`, these are called `tibble()` and behave slightly different to regular data frames. For our purposes however, these differences are not important.

The filtering using `filter()` is very useful, but you can see that the commands can become very long when you have many filters. Also, trying out many different filters to see what they do with the data can be cumbersome. This where `%>%` comes in really handy.

```
# this is how we filtered our data frame earlier
filter(be, OWS_egg == 1)
```

56

species	con-fam-	ser-con-	size	OVS	OWS	sup-pag	Vag	GEN	Av- male	WSP_Fe-er	WSP_Fe-ELT	sin-ELT	FM_Av-er	AFB_Av-ey-	AFB_i-	AFB_min-	AFB_max	AFB_all	power									
																				species	ang	pro	age	Gen	Gen	Gen	Gen	Gen
BreNy1991-5	1	0	0	0	1.00	0.01	0.00	0.04	0.8	0.4	0.8	0	1	0	0	25	22	7	500	1	0	0	0	0	0	0		
this_hecate																												
dae																												
BreNy6991-5	1	1	0	0	1.00	0.01	0.00	0.03	7.8	0.2	0.4	1	1	0	0	200	20	51	1	0	1	0	0	0	0	0		
this_ino																												
dae																												
CaPi1991-5	1	1	1	1	3.00	0.03	0.00	0.05	0.00	NAN	0	0	0	1	1	1	1	0	0	200	0	1	0	NAN	NAN	NAN	NAN	
siliado-																												
rella																												
CoPi1991-5	5	1	1	0	0	1.00	0.01	0.00	0.04	7.00	0.70	71	1	0	0	1	0	0	0	250	3000	1	0	1	0	0	0	0
l- dae																												
ias_palaeno																												
CyLyNA5	5	1	1	1	1	3.00	0.03	0.00	0.02	7.5	0.28	90	1	0	0	0	1	0	200	3300	NAN	0	0	0	0	0	0	
clyrusidae-																												
bianus																												
DanNy1991-5	1	1	1	1	3.00	0.03	0.00	0.07	0.20	0.35	40	1	0	0	NAN	NAN	0	110	100.3	1	0	0	0	0	0	0	0	
pui-																												
dae																												
EreNy1991-5	1	1	0	0	0.50	0.50	0.50	0.03	4.0	0.50	0.00	1	0	0	NAN	NAN	120	100.3	000	1	0	0	0	0	0	0	0	
biai-eri-																												
phydae																												
EreNy2091-5	1	1	0	0	0.70	0.51	0.00	0.54	4.0	0.09	0.60	1	0	0	1	0	0	60	190	002	1	0	0	0	0	0	0	
biai-eu-																												
ryadae																												
EreNy1991-5	1	1	0	0	0.70	0.51	0.00	0.54	1.00	0.18	31	1	0	0	1	0	0	0	250	3002	1	0	0	0	0	0	1	
biai_ligea					</																							

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

```
# Multiple filters are connected by pipes
be %>%
  filter(OWS_egg == 1) %>%
  filter(LEV_ground_layer == 1) %>%
  filter(AFB_honeydew == 1)
```

```
# As always in R, assign the result to a new variable using "<-"
be_filtered <- be %>%
  filter(OWS_egg == 1) %>%
  filter(LEV_ground_layer == 1) %>%
  filter(AFB_honeydew == 1)
```

4.5 Sort by column with arrange()

This doesn't change the dataframe itself, it simply orders the columns (similar to the sort function in Excel):

```
# sort by age (ascending) and weight (descending)
be %>%
  arrange(conserv.eu, -range.size)
```

[illegible]

species	family	con- serva- tion status	size	OVS	SVL	sup- ova	GEN	Av- male	av- er	WSP_Fe- Fe-	ELT	sin- er-	FM_Av- er-	AFB_AFB- ey- i-	AFB- an- AFB_min-	power	WSP_Fe-												
																	sp- G	ang- p	size	ova	page	avg	G	av- male	av- er	WSP_Fe- Fe-	ELT	sin- er-	FM_Av- er-
Paragryllus	Pyrrhidae	1	1	1	3.08	0.03	0.00	0.45	5.3	0.10	21	1	0	0	1	0	0	0	100	12.0	0	0	1	1	1	0	0		
Piezodorus	Piezodoridae	1	1	1	3.08	0.03	0.00	0.62	5.5	0.28	9	1	1	1	0	0	1	1	20	12.0	1	0	0	0	0	0	0		
Nymphobius	Nymphobiidae	0	0	1	1.50	0.02	0.01	0.62	0.02	0.13	6	0	0	1	1	0	0	1	0	26	0	57	1	0	1	0	1	1	
Lophogryllus	Lophogryllidae	1	0	0	1.00	0.01	0.00	0.44	8.0	0.08	6	1	1	0	0	1	0	0	10	14.0	5	1	0	0	1	1	0	1	
Phyllotettix	Phyllotettigidae	3	0	1	0	0	1.00	0.01	0.00	0.34	4.0	1.00	0	1	1	0	0	1	0	10	15.0	0	0	1	0	0	0	0	
Coelocoryphus	Coelocoryphidae	0	0	0	1.00	0.01	0.00	0.30	4.0	0.15	4	0	1	0	0	1	0	0	0	80	3.53	1	0	1	0	0	0	0	
Pyrrhus	Pyrrhidae	3	1	1	0	0	1.00	0.01	0.00	0.27	2.0	0.40	8	1	1	0	0	1	0	10	3.00	2	1	0	0	0	0	0	1
Colpocoryphus	Colpocoryphidae	3	0	1	0	0	2.50	0.03	0.01	0.44	8.0	0.40	8	1	1	0	0	1	0	15	7.00	0	1	0	0	0	0	0	0
Bolbitis	Bolbitidae	0	1	0	0	0	1.00	0.01	0.00	0.41	5.0	0.20	NAN	NAN	NAN	NAN	NAN	1	0	0	10	13.0	0	53	NAN	NAN	NAN	NAN	NAN
Erebicus	Erebicidae	0	1	0	0	0	1.00	0.01	0.00	0.28	3.0	1.00	NAN	NAN	NAN	NAN	NAN	1	0	0	60	16.0	5	1	0	0	0	0	0
Polysphincta	Polysphinctidae	3	3	NAN	NAN	NAN	1.00	0.01	0.00	0.33	6.0	0.50	7	NAN	NAN	NAN	NAN	NAN	40	16.00	NAN	NAN	NAN	NAN	NAN	NAN	NAN	NAN	
Eupephippus	Eupephippidae	3	0	0	1	0	1.50	0.02	0.01	0.34	4.0	0.50	0	0	0	0	1	1	0	80	4.00	1	0	0	0	0	0	0	0

[illegible]

species	range	size	con-	fam-	ser-	con-	OVS	WSp	sup-	GEN_Av-	male_av-	er-WSP_Fe-	WSP_Fe-										ELT_sin-	er-	FM_Av-				ey-	i-	AFB_an-				AFB_min-	power		
													GEN_Av-	male_av-	er-WSP_Fe-	ELT_sin-	er-	FM_Av-	ey-	i-	AFB_an-	AFB_min-																
Lys-5751	4	1	0	0	0	1.50	0.02	0.1	0.033	0	1.00	0.01	0	0	0	1	0	0	100	240	000	1	0	0	0	0	0	1	1									
dracacoidae																																						
don																																						
Li-Ny-5261	4	0	1	0	0	1.00	0.01	0.0	0.077	0	1.00	0.01	0	0	1	1	0	0	100	153	051	0	0	0	0	0	1	1	0									
meni-																																						
tis-dep-																																						
uli																																						
Ly-Ly-5195	4	0	1	0	0	1.00	0.01	0.0	0.034	0	0.57	0.71	1	0	0	1	0	0	250	000	1	0	0	0	0	0	0	0										
caeracidae																																						
ci-																																						
phron																																						
Thy-Ho-496	4	0	1	0	0	1.50	0.02	0.1	0.024	0	0.10	0.80	1	0	0	0	1	0	250	053	1	0	0	0	0	0	0	0										
cuspoiteon																																						
idae																																						
Me-Ny-4671	4	0	1	0	0	1.50	0.02	0.1	0.035	0	0.12	0.61	1	0	0	0	0	1	100	210	055	1	0	0	0	0	0	0	1									
taei-di-																																						
amide																																						
Hip-Ny-3661	4	0	1	0	0	1.00	0.01	0.0	0.045	0	0.12	0.31	1	0	0	1	0	0	250	004	1	0	1	0	0	1	1											
parhia_statil-																																						
i- dae																																						
nus																																						
PaPa-354	4	1	1	0	0	1.00	0.01	0.0	0.080	0	0.20	0.41	0	0	0	1	1	0	300	051	1	0	0	0	0	0	0	0										
naspil-																																						
siusonpollo																																						
idae																																						
Ph-Ny-354	4	0	1	0	0	1.00	0.01	0.0	0.036	0	0.57	0.71	1	0	0	1	1	0	100	200	000	1	0	0	0	0	0	0										
garacidae																																						
con																																						
Cha-Ny-3531	4	0	1	0	0	1.00	0.01	0.0	0.055	0	0.33	0.31	1	0	0	1	1	0	250	004	1	0	0	0	0	0	1	1										
arai-bri-																																						
seidae																																						
Pol-Ly-330	4	0	1	0	0	1.50	0.02	0.1	0.032	0	0.20	0.41	1	0	0	1	0	0	100	220	000	1	0	0	0	0	0	0										
omacidae																																						
tus-do-																																						
ry-																																						
las																																						

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species	range	size	OVS	WSP	sup-	GEN_Av-	male_av-	er-WSP_Fe-	BMS	EN	EAT	ENT	ELT	sin-	er-	FM_Av-	AFB_Av-	AFB_an-	AFB_min-	power
Cyanar-	935	5	1	0	0	1.25	0.1	50.529	8	0.16	90	1	0	0	1	0	0	0	0	0
caenidae																				
gus																				
Thyrid-	946	5	1	0	0	0	1.00	0.1	00.025	5	0.06	70	1	0	0	0	1	1	0	1
cuspid-																				
ne-idae																				
ola																				
Pontia	925	5	0	0	1	0	3.00	0.3	00.041	5	0.06	10	1	0	0	1	1	0	0	0
dep-																				
lidice																				
Nymphal-	945	5	0	0	1	0	1.25	0.1	50.567	5	0.19	20	0	1	1	0	0	1	0	1
tiopa																				
dae																				
Apria	894	5	0	1	0	0	1.00	0.1	00.062	5	0.08	20	1	1	0	0	0	1	0	1
aria																				
larataegi																				
Fal-	881	5	1	1	0	0	1.00	0.1	00.053	5	0.50	00	1	0	0	1	0	0	0	1
Nymphal-																				
ciaia_adippe																				
dae																				
La-Nymphal-	881	5	0	1	0	0	2.00	0.3	02.047	5	0.07	20	1	0	0	1	1	0	0	0
sion-																				
ma-																				
maemaera																				
Ery-	842	5	0	1	0	0	1.50	0.2	01.030	0	0.12	90	1	0	0	1	0	0	0	0
nis																				
perges																				
idae																				
Thyrid-	882	5	0	1	0	0	1.00	0.1	00.026	5	0.10	10	1	0	0	0	1	0	0	1
cuspid-																				
silvestris																				
idae																				
Hipparchia	811	5	0	1	0	0	1.00	0.1	00.051	0	0.14	31	1	0	0	1	0	0	0	0
parchia_semele																				
dae																				
Hes-	807	5	1	1	0	0	1.00	0.1	00.031	0	0.33	31	1	0	0	1	0	0	0	0
pe-peri-																				
ria																				
idamma																				
Mel-	802	5	0	1	0	0	1.00	0.1	00.047	5	0.10	71	1	0	0	1	1	0	0	0
Nymphal-																				
nari-																				
giadagathia																				

species	range	size	OVS	WSP_Fe-	supu-	GEN_Av-	male_av-	er-WSP_Fe-	ELT_sin-	er-	FM_Av-	AFB_Av-	AFB_an-	AFB_min-	power									
FavLy-775	5	1	0	0	0	1.00	01.00	032.6	0.4080	0	0	1	1	0	0	200002	0	0	0	1	0	1	1	
niusacridae																								
cus																								
PleLy-774	5	1	0	0	0	1.50	02.01	024.5	0.0410	1	0	0	1	0	0	10023000	000	1	0	0	0	0	0	
be-caenidae																								
jus_idas																								
Ly-Ly-756	5	0	1	0	0	1.00	01.00	027.6	0.4081	0	0	0	1	0	0	20023000	000	1	0	0	0	0	0	
caeracridae																								
gau-																								
reae																								
IphPa-755	5	0	0	1	0	2.00	03.02	077.06	0.1051	1	0	0	1	0	0	0	200004	1	0	1	0	0	1	0
i- pil-																								
cliden-po-																								
dalidae																								
ius																								
CuLy-753	5	0	1	0	0	1.50	02.01	023.0	0.1050	1	0	0	1	0	0	0	280000	1	0	0	0	0	1	1
pidacridae																								
imus																								
CoenLy-761	5	0	1	0	0	1.25	01.50	537.6	0.1690	1	0	0	1	1	0	0	230053	1	0	1	0	0	0	0
ca-i-																								
niadae																								
AriLy-700	5	0	1	0	0	2.00	03.02	025.6	0.1021	1	0	0	1	0	0	0	190000	1	0	0	0	0	1	1
ciaacridae																								
BreLy-699	5	1	1	0	0	1.00	01.00	037.8	0.2041	1	0	0	1	1	0	0	200051	1	0	1	0	0	0	0
this_ino																								
dae																								
CoPic-682	5	0	1	1	0	2.50	03.01	045.00	0.2041	1	0	0	1	0	0	0	180051	1	0	0	0	0	0	0
l- dae																								
ias_hyale																								
Ly-Ly-673	5	0	1	0	0	2.00	03.02	030.0	0.1361	1	0	0	1	0	0	0	250000	1	0	0	0	0	0	0
caeracridae																								
MeLy-671	5	0	1	0	0	1.50	02.01	035.9	0.2891	1	0	0	0	0	1	0	260004	1	0	0	0	0	0	0
taen_cinxia																								
dae																								
TheLy-628	5	1	0	0	0	1.00	01.00	035.00	0.1290	0	1	0	1	0	0	0	160051	1	0	0	1	0	0	0
clacridae																								
tu-																								
lae																								

species	range	size	OVS	SW	sup- page	GEN	Av- male	WSP_Fe- er	WSP_Fe- er	ELT_sin- er	FM_Av- er	AFB		AFB		an- AFB_min	power	
												ey-	i-	AFB	AFB			
Aranypha- niai-lev- anadae	Ny-625	1	0	0	1	0	2.00	0.03	0.02	0.33	51	0.70	70	1	0	0	0	0
Meny-625 tae- didyma dae	Ny-625	1	0	1	0	0	2.50	0.03	0.01	0.37	04	0.05	10	1	0	0	0	0
Chaperi- o-idae	He-615	5	0	1	0	0	2.50	0.03	0.01	0.30	8	0.16	70	1	0	0	0	0
dus_al- ceae	Ly-605	5	0	0	1	0	1.00	0.01	0.00	0.29	8	0.06	50	1	0	0	0	1
Glaucop- syenidae	Ly-605	5	0	1	0	0	2.00	0.03	0.02	0.31	6	0.18	31	0	0	0	0	1
che_al- lexis	Ly-605	5	0	1	0	0	2.00	0.03	0.02	0.31	6	0.18	31	0	0	0	0	1
dracabul- largo	Ly-586	5	1	0	0	0	1.00	0.01	0.00	0.34	4	0.10	20	0	1	0	1	0
Satyr- cis caenidae	He-585	5	0	1	0	0	1.00	0.01	0.00	0.27	6	0.12	60	1	0	0	0	0
Cahe- ro-peri- cephalus	He-585	5	0	1	0	0	1.00	0.01	0.00	0.27	6	0.12	60	1	0	0	0	0
palae- mon	Ny-575	1	0	0	0	0	1.50	0.02	0.01	0.28	6	0.25	80	1	0	0	0	1
Coen- e-i- riidae	Ny-575	1	0	1	0	0	1.00	0.01	0.00	0.70	00	0.30	60	0	1	0	1	0
Ap- atura iris	Ny-565	1	1	1	0	0	0.75	0.51	0.00	0.54	100	0.18	31	1	0	0	0	0
biai-ligea	Ny-565	1	1	1	0	0	0.75	0.51	0.00	0.54	100	0.18	31	1	0	0	0	0
dae	Ny-555	1	0	1	0	0	2.00	0.03	0.02	0.33	0	0.40	70	1	0	0	0	0
Bol- ria i-dia	Ny-555	1	0	1	0	0	2.00	0.03	0.02	0.33	0	0.40	70	1	0	0	0	0
dae	Ny-555	1	0	1	0	0	2.00	0.03	0.02	0.33	0	0.40	70	1	0	0	0	0
Coen- lia i- dae	Ny-555	1	0	0	1	0	1.00	0.01	0.00	0.31	51	0.10	50	1	0	0	0	1

Species	con- fam- serv- con- OWS	size	OVS	SW	sup- OWS	WSP_Fe-										FM_Av-	AFB_AFB_					AFB_min-					
						GEN_Av-	male_av-	er-WSP_Fe-	ELT_sin-	er-	ey-	i-	AFB_min-														
SatLy1555_w- alb-caenidae	1	0	0	0	1.00	0.01	0.00	0.30	0.0	0.06	50	0	1	1	1	0	0	0	1700	000	1	0	0	1	0	0	0
PolLy5445_o-caenidae	5	0	1	0	0	1.50	0.02	0.01	0.31	0.0	0.20	41	1	0	0	1	0	0	10200	000	1	0	0	0	0	0	1
tus_aman- dus																											
EuNy5381-phidryas_aurinae	5	0	1	0	0	1.00	0.01	0.00	0.36	0.53	0.10	21	1	0	0	0	0	1	0	2600	053	1	0	0	0	0	0
ApNy5281-atuira_ilia dae	5	0	1	0	0	1.50	0.02	0.01	0.68	0.8	0.26	70	0	1	1	1	0	0	50185	053	1	0	0	1	1	1	1
Li-Ny5261-meiti-daemilla	5	0	1	0	0	1.00	0.01	0.00	0.56	0.8	0.28	90	0	1	1	1	0	0	0	1500	002	1	1	1	1	1	1
MeNy5251-taei_phoebe dae	5	0	1	0	0	1.50	0.02	0.01	0.44	0.51	0.16	40	1	0	0	0	0	1	0	2700	055	1	0	0	0	0	0
PyNy5151-ro-i-niadaetthonus	5	0	1	0	0	1.00	0.01	0.00	0.36	0.0	0.08	11	1	0	0	1	0	0	0	2300	053	1	0	1	0	0	0
HaNy4975-cina-dinidae	5	0	0	1	0	1.00	0.01	0.00	0.32	0.3	0.57	71	1	0	0	0	1	0	0	1700	000	1	0	0	0	0	0
CoPie4945-l-ias_al-facarien-sis	5	0	1	0	0	2.50	0.03	0.01	0.43	0.3	0.16	71	1	0	0	1	0	0	0	2600	051	1	0	0	0	0	0
SatLy1485-caenidae	5	0	0	0	0	1.00	0.01	0.00	0.30	0.0	0.16	70	0	1	0	1	1	0	0	2000	051	1	0	1	1	0	0
AgLy4805-adesacompidae	5	0	1	0	0	1.00	0.01	0.00	0.25	0.8	0.20	81	1	0	0	1	0	0	0	2800	000	1	0	1	0	0	1
BolNy4781-ria_i-aquilonaridae	5	0	1	0	0	1.00	0.01	0.00	0.36	0.8	0.28	91	1	0	0	1	0	0	100190	002	1	0	1	0	0	0	0

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Species	con- fam- serv- con- OWS	size	var	page	agg	vgs	Cach	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17	H18	H19	H20	H21	H22	H23	H24	H25	H26	H27	H28	H29	H30	H31	H32	H33	H34	H35	H36	H37	H38	H39	H40	H41	H42	H43	H44	H45	H46	H47	H48	H49	H50	H51	H52	H53	H54	H55	H56	H57	H58	H59	H60	H61	H62	H63	H64	H65	H66	H67	H68	H69	H70	H71	H72	H73	H74	H75	H76	H77	H78	H79	H80	H81	H82	H83	H84	H85	H86	H87	H88	H89	H90	H91	H92	H93	H94	H95	H96	H97	H98	H99	H100	H101	H102	H103	H104	H105	H106	H107	H108	H109	H110	H111	H112	H113	H114	H115	H116	H117	H118	H119	H120	H121	H122	H123	H124	H125	H126	H127	H128	H129	H130	H131	H132	H133	H134	H135	H136	H137	H138	H139	H140	H141	H142	H143	H144	H145	H146	H147	H148	H149	H150	H151	H152	H153	H154	H155	H156	H157	H158	H159	H160	H161	H162	H163	H164	H165	H166	H167	H168	H169	H170	H171	H172	H173	H174	H175	H176	H177	H178	H179	H180	H181	H182	H183	H184	H185	H186	H187	H188	H189	H190	H191	H192	H193	H194	H195	H196	H197	H198	H199	H200	H201	H202	H203	H204	H205	H206	H207	H208	H209	H210	H211	H212	H213	H214	H215	H216	H217	H218	H219	H220	H221	H222	H223	H224	H225	H226	H227	H228	H229	H230	H231	H232	H233	H234	H235	H236	H237	H238	H239	H240	H241	H242	H243	H244	H245	H246	H247	H248	H249	H250	H251	H252	H253	H254	H255	H256	H257	H258	H259	H260	H261	H262	H263	H264	H265	H266	H267	H268	H269	H270	H271	H272	H273	H274	H275	H276	H277	H278	H279	H280	H281	H282	H283	H284	H285	H286	H287	H288	H289	H290	H291	H292	H293	H294	H295	H296	H297	H298	H299	H300	H301	H302	H303	H304	H305	H306	H307	H308	H309	H310	H311	H312	H313	H314	H315	H316	H317	H318	H319	H320	H321	H322	H323	H324	H325	H326	H327	H328	H329	H330	H331	H332	H333	H334	H335	H336	H337	H338	H339	H340	H341	H342	H343
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species	con- fam- ser- con- size	OVS	WSP	sup- WSP	WSP_Fe-										ELT_sin- er-	FM_Av- er-	AFB		AFB_min- power
					GEN_Av-	male_av-	er-WSP_Fe-	BMSI	EN	FA	TE	TE	TE	TE			ey- i-	AFB	
Nep- tis i-sap- pholae	1011	5	0	1	0	0	1.50	0.02	0.01	0.05	4.8	0	0	0	0	0	0	0	0
Py-Ny- ro-i- niadath- seba	1011	5	0	1	0	0	1.00	0.01	0.00	0.03	7.0	0	0	35	41	1	0	0	0
Gl- copsy- che_melanops	103	5	0	0	1	0	1.00	0.01	0.00	0.02	7.00	0	0	22	40	1	0	0	0
Bol- ria i-pales dae	1011	5	0	1	0	0	1.00	0.01	0.00	0.03	6.8	0	0	25	80	1	0	0	0
Ere-Ny- biai-gorge dae	921	5	0	1	0	0	0.50	0.50	0.50	0.03	7.0	0	0	30	60	1	0	0	0
Hip-Ny- parhia_fidia dae	921	5	0	1	0	0	1.00	0.01	0.00	0.05	9.0	0	0	14	40	1	0	0	0
Ere-Ny- biai-manto dae	891	5	1	1	0	0	0.50	0.50	0.50	0.03	9.00	0	0	30	60	1	0	0	0
Ere-Ny- biai-oeme dae	891	5	0	1	0	0	0.70	0.51	0.00	0.54	2.8	0	0	10	01	1	0	0	0
Mul-His- peri- idae	885	5	0	0	0	0	1.00	0.01	0.00	0.03	4.9	0	0	57	71	1	0	0	0
Kir-Ny- e-i- landae	861	5	0	1	0	0	1.00	0.01	0.00	0.06	0.0	0	0	2	0	0	0	0	0
Mel-Ny- nari- giadac- c- i- tan- ica	851	5	0	1	0	0	1.00	0.01	0.00	0.05	1.00	0	0	10	41	1	0	0	0

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			WSP_Fe-																	FM_Av-			AFB_AFB-an-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
con-			GEN_Av-			male_av-			WSP_Fe-			ELT_sin-			er-			ey- i- AFB_min-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
fam-	serv-	con-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-	OWS_Sap-

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		WSP_Fe-																									
		con-	GEN_Av-	male_av-															FM_Av-	AFB_Av-	AFB_an-						
		fam- sercon-	OWS	supu-	er-WSP_Fe-															ey- i-	AFB_min-						
species	range	size	OWS	pag	WSP_Fe-	OWS	pag	WSP_Fe-	OWS	pag	WSP_Fe-	OWS	pag	WSP_Fe-	OWS	pag	WSP_Fe-	OWS	pag	WSP_Fe-	OWS	pag					
EreNy13pha5	biai-gor-	gonidae	0	1	0	0	1.00	01.00	041.0	0.57	N	N	N	N	N	N	N	N	15052.00	1	0	0	0	0	0	0	
HipNy13pha5	parhia_aris-	taedae	0	1	0	0	1.00	01.00	052.0	1.00	N	N	N	N	N	N	N	N	200055	1	0	0	0	0	0	0	
PolLy135	omnaenidae	tus_aroanien-	5	0	1	0	0	1.00	01.00	030.5	1.00	0	0	1	0	0	1	0	4006000	N	N	N	N	N	N	N	N
EreNy12pha5	biai-lefeb-	vredae	0	1	0	0	1.00	01.00	044.0	0.77	N	N	N	N	N	N	N	N	1600000	N	N	N	N	N	N	N	N
PolLy115	omnaenidae	tus_fab-	5	0	1	0	0	1.00	01.00	030.5	1.00	0	0	1	0	0	N	N	900603.00	1	0	0	0	0	0	1	
PolPie1-5	tia dahl-	ridice	5	0	0	1	0	2.50	03.01	038.3	0.23	6	1	0	0	1	0	0	250004	N	N	N	N	N	N	N	N
EreNy10pha5	biai-aethiopella	dae	0	1	0	0	1.00	01.00	038.0	1.00	N	N	N	N	N	N	N	N	180002.00	N	N	N	N	N	N	N	N
EreNy10pha5	biai-rhodopen-	sis dae	0	1	0	0	1.00	01.00	036.3	0.57	N	N	N	N	N	N	N	N	1400051	1	0	0	0	0	0	0	
EreNy10pha5	biai-sthen-	nyodae	0	1	0	0	1.00	01.00	042.0	0.57	N	N	N	N	N	N	N	N	170002.51	N	N	N	N	N	N	N	N
PleLy105	be-caenidae	jus_bel-	5	N	N	N	N	N	N	N	1.00	01.00	023.0	0.35	N	N	N	N	140000	1	0	0	0	0	0	0	
ThyHe1-5	cuspid-	traxidae	5	N	N	N	N	N	N	N	1.00	01.00	032.5	0.10	N	N	N	N	200000	1	0	0	0	0	0	0	

			WSP_Fe-												FM_Av-		AFB_AFB_an-											
	con-	ser-	con-	OVS	SV	Sup-	GEN_Av-	male_av-	er-WSP_Fe-	ELT_sin-	er-	er-	er-	er-	er-	ey-	i-	AFB_min-										
species	range	size	OVS	SV	Sup-	GEN_Av-	male_av-	er-WSP_Fe-	ELT_sin-	er-	er-	er-	er-	er-	er-	ey-	i-	AFB_min-										
Zerpa- thia- ica- ion- idae	Pa-7	5	5	0	0	1	0	1.00	0.01	0.05	2.5	0.70	70	1	0	0	1	1	0	0	1000	51	1	0	0	0	0	0
CoPi- l- ias_ty- che	Pi-5	5	0	1	0	0	1.00	0.01	0.04	5.00	0.28	91	0	0	0	1	0	0	0	700	3.00	1	0	0	0	0	0	0
EreNy- biai-za- p- a- teri	Pha-5	5	0	1	0	0	1.00	0.01	0.03	8.0	0.28	NAN	NAN	NAN	NAN	NAN	NAN	NAN	NAN	1000	53.51	1	0	0	0	0	0	0
PseNy- doci- haz- ara_gey- eri	Pha-5	5	0	1	0	0	1.00	0.01	0.04	9.0	1.00	NAN	NAN	NAN	NAN	NAN	NAN	NAN	NAN	1250	2.00	1	0	0	0	0	0	0
Agly- adesa- naicus	Pha-5	5	5	0	1	0	0	1.00	0.01	0.02	5.0	1.00	0	0	0	1	0	0	1800	NAN	1	0	0	0	0	0	0	1
EreNy- biai-ori- en-dae talis	Pha-5	5	0	1	0	0	1.00	0.01	0.03	0.3	0.28	NAN	NAN	NAN	NAN	NAN	NAN	NAN	NAN	1800	2.51	1	0	0	0	0	0	0
EreNy- biai-palar- ica-dae	Pha-5	5	NAN	NAN	NAN	1.00	0.01	0.05	8.0	0.28	91	1	0	0	0	1	0	1000	53.00	1	0	0	0	0	0	0	0	
KrLy- ta-caenidae nia_psy- lorita	Pha-5	5	5	NAN	NAN	NAN	1.00	0.01	0.02	4.3	0.57	70	1	0	0	NAN	NAN	950	105.00	1	0	0	0	0	0	0	0	
MaNy- iolai-nurag dae	Pha-5	5	0	1	0	0	1.00	0.01	0.03	8.0	1.00	0	1	0	0	1	1	0	4000	3.51	1	0	0	0	0	0	0	0
MeNy- nari- giadph- herusa	Pha-5	5	0	1	0	0	1.00	0.01	0.04	8.0	0.28	NAN	NAN	NAN	NAN	NAN	NAN	NAN	NAN	6000	2.51	1	0	0	0	0	0	0

	WSP_Fe-															
	con-	GEN_Av-	male_av-	FM_Av-	AFB_Av-	AFB_an-	con-	GEN_Av-	male_av-	FM_Av-	AFB_Av-	AFB_an-	con-	GEN_Av-	male_av-	FM_Av-
species	con-	GEN_Av-	male_av-	FM_Av-	AFB_Av-	AFB_an-	con-	GEN_Av-	male_av-	FM_Av-	AFB_Av-	AFB_an-	con-	GEN_Av-	male_av-	FM_Av-
Tanly-4 5 5	NANANANA	3.00	0.03	0.00	0.21	0.0	0.35	40	0	1	0	1	0	0	0	250
cusca- midpar- tus																
HipNy-2pha-5	0	1	0	0	1.00	0.01	0.00	0.51	0.06	0.28	91	1	0	0	1	1000
parhia_pel- lu-dae cida																
ManNy-2pha-5	0	1	0	0	1.00	0.01	0.00	0.41	0.9	0.28	91	1	0	0	1	800
iola- chia- dae																
HipNymp-1pha-5																
parhia_chris- tendae																
Psdly-1 5 5	0	1	0	0	1.00	0.01	0.00	0.22	0.0	1.00	00	1	0	0	NANANA	7000
dopla- noidae barba- giae																
CalHes-NA5	5	NANANANA	3.00	0.03	0.00	0.30	0.8	1.00	NANANANANANANANA	0	250	000	NANANANANANANA			
chaperi- o-idae dus_tripoli- nus																
CyLy-NA5	5	1	1	1	1	3.00	0.03	0.00	0.27	0.5	0.28	90	1	0	0	200
clyrius- noidae bianus																
EreNy-NA5	5	0	1	0	0	1.00	0.01	0.00	0.38	0.8	1.00	NANANANANANANANA	1500	000	1	0
biai-ron- doudae																
EuPien-NA5	5	0	0	1	0	2.50	0.03	0.01	0.34	0.0	0.03	61	1	0	0	300
chlaechar- lonia																
EuPien-NA5	5	0	0	1	0	2.00	0.02	0.00	0.40	0.8	0.28	90	1	0	0	1700
chlae- ev- ersi																
EuPien-NA5	5	NANANANA	2.00	0.02	0.00	0.40	0.8	1.00	NANANANANANANANA	50	190	000	NANANANANANANA			
chlae- granca- narien- sis																

		WSP_Fe-																	
con-	GEN_Av-	male_av-															FM_Av-	AFB_Av-	AFB_an-
fam- sercon- OVS	WSP_Fe-	er-WSP_Fe-	ELT_sin-	er-	ey-	i-	AFB_min-												power
species	range	size	OWS	WSP_Fe-	er-WSP_Fe-	ELT_sin-	er-	ey-	i-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-
Pyris-29	NANA	0	1	0	0	1.00	0.01	0.00	0.28	3	0.5	N	N	N	N	N	N	N	N
guspeulquieri																			
idae																			
KrLy-16	4	N	0	1	0	0	1.00	0.01	0.00	0.29	3	1.00	0	0	1	0	0	0	0
ta-caenidae																			
nia_py-																			
laon																			
DanLy-15	NANA	0	0	0	1	3.00	0.03	0.00	0.95	53	0.50	0	0	1	0	0	0	40	1.2
ip-i-																			
pusdae																			
VanLy-12	NANA																		
ginien-																			
sis dae																			
CoenLy-11	NANA																		
en-i-																			
talidae																			
ColB-10	NANA	0	0	1	0	3.00	0.03	0.00	0.33	0	0.70	0	1	0	0	1	0	0	0
tis devagore																			
HipNym-9	NANA																		
parishia_blachieri																			
dae																			
KrLy-6	4	N	0	1	0	0	1.00	0.01	0.00	0.31	0	0.70	1	1	0	0	N	N	N
ta-caenidae																			
nia_trappi																			
Ly-Ly-6	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
caementidis																			
PseNym-6	NANA	0	1	0	0	1.00	0.01	0.00	0.50	0	1.00	N	N	N	N	N	N	N	N
dod-																			
hazdae																			
ara_mer-																			
curius																			
ProNym-5	NANA	0	1	0	0	1.00	0.01	0.00	0.46	0	1.00	0	1	0	0	1	1	0	15
tere-																			
biadphegea																			
PseNym-5	NANA	0	1	0	0	1.00	0.01	0.00	0.50	0	N	N	N	N	N	N	N	N	N
dod-																			
hazdae																			
ara_williamsi																			

	con- fam- species	con- size range	OVS var	SFS pag	CWS agg	GEN Catt	Av- male	WSP_Fe- er-WSP_Fe-	ELT_sin- er-	FM_Av- er-	AFB_AFB- ey- i- AFB_min-	AFB- an- AFB_max	AFF- power																
HipNymphalidae	NAN	0	1	0	0	1.00	0.01	0.05	1.06	0.28	NAN	NAN	NAN	NAN	NAN	0	1300	0.53	0	0	0	0	0	1	1				
parhia_mersinae																													
dae																													
PleLy3	NAN	NAN	NAN	NAN	NAN	NAN	1.00	0.01	0.00	0.28	3	0.7	NAN	NAN	NAN	NAN	NAN	0	3000	0.51	1	0	0	0	0	0	0		
be-caenidae																													
jidea_loewii																													
CaHe2	NAN	NAN	NAN	NAN	NAN	NAN	3.00	0.03	0.00	0.30	0	0.2	NAN	NAN	NAN	NAN	NAN	700	1.70	0.00	NAN	NAN	NAN	NAN	NAN	NAN			
chaperi- o-idae																													
dus_staud- eri																													
KrLy2	NAN	NAN	0	1	0	0	1.00	0.01	0.00	0.29	3	0.4	1	0	0	NAN	NAN	1000	1.20	0.00	NAN	NAN	NAN	NAN	NAN	NAN			
ta-caenidae																													
nia_eu- ryp- ilus																													
MaNy2	NAN	NAN	0	1	0	0	1.00	0.01	0.00	0.41	5	0.2	8	1	0	0	1	1	0	0	900	0.53	1	0	1	0	0	0	0
ioli-megala																													
dae																													
PolLy2	NAN	NAN	NAN	NAN	NAN	NAN	1.00	0.01	0.00	0.30	0	1.0	NAN	NAN	NAN	NAN	NAN	500	2.30	0.51	NAN	NAN	NAN	NAN	NAN	NAN			
omacranidae																													
tus_iphi- ge- nia																													
PsenNy2	NAN	NAN	0	1	0	0	1.00	0.01	0.00	0.52	0	0.5	NAN	NAN	NAN	NAN	NAN	1000	2.00	NAN	NAN	NAN	NAN	NAN	NAN	NAN			
doi-hazidae																													
ara_cin- govskii																													
YptNympha	NAN	0	1	0	0	3.00	0.03	0.00	0.30	0	0.5	0	0	0	1	0	0	0	1200	0.51	1	0	0	0	0	0	0		
teri- opidae																													
BonHe1	NAN	0	1	0	0	2.50	0.03	0.01	0.29	0	0.3	3	1	0	0	1	0	0	0	1000	1.51	1	0	0	0	0	0	0	
bonperi- icaidae																													
PelHe1	NAN	0	1	1	0	3.00	0.03	0.00	0.39	5	0.2	1	8	0	1	0	0	500	1.50	0.0	1	0	0	0	0	0	0		
i- peri- dasidhrax																													

[illegible]

```
# choose which columns to keep
be %>%
  select(species, range.size, conserv.eu, FM Average, WSP_Female average)
```

species	range.size	conserv.eu	FM_Average	WSP_Female_average
Aglais_io	1136	5	7.5	53.5
Aglais_urticae	1271	5	7.5	48.0
Agriades_aquilo	21	5	3.0	23.0
Agriades_dardanus	2	4	4.0	25.0
Agriades_glandon	45	5	2.0	23.0
Agriades_optilete	480	5	3.0	25.0
Agriades_orbitulus	63	5	3.0	26.0
Agriades_pyrenaicus	5	5	NA	25.0
Agriades_zullichii	2	2	3.0	23.5
Anthocharis_cardamines	1245	5	4.0	40.5
Anthocharis_damone	19	5	3.0	39.5
Anthocharis_euphenoides	131	5	3.5	37.0
Anthocharis_gruneri	36	5	4.0	33.0
Apatura_ilia	528	5	4.5	68.0
Apatura_iris	571	5	2.5	70.0
Apatura_metis	47	5	4.0	62.0
Aphantopus_hyperantus	1002	5	3.0	38.5
Aporia_crataegi	894	5	3.5	62.5
Araschnia_levana	626	5	5.0	33.5
Archon_apollinus	13	5	3.5	57.0
Arethusana_arethusa	229	5	3.5	41.0
Argynnis_laodice	100	4	2.0	55.0
Argynnis_pandora	320	5	5.0	72.0
Argynnis_paphia	1024	5	4.0	62.0
Aricia_agestis	700	5	7.0	25.0
Aricia_anteros	43	5	5.0	28.0
Aricia_artaxerxes	435	5	4.0	27.5
Aricia_cramera	138	5	9.5	25.0
Aricia_montensis	32	5	4.0	27.5
Aricia_morronensis	15	5	4.0	28.0
Aricia_nicias	78	5	2.0	25.5
Azanus_jesous	NA	NA	NA	21.5
Azanus_ubaldus	NA	NA	NA	12.5
Boloria_aquilonaris	478	5	2.0	36.0
Boloria_chariclea	22	4	1.5	38.0
Boloria_dia	554	5	5.5	33.0
Boloria_eunomia	311	5	3.0	36.5
Boloria_euphrosyne	963	5	4.0	36.0
Boloria_freija	144	5	2.5	34.5
Boloria_frigga	145	5	2.0	42.5

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Boloria_graeca	37	5	4.0	36.0
Boloria_improba	6	2	2.0	32.5
Boloria_napaea	112	5	3.0	39.0
Boloria_pales	101	5	3.0	36.0
Boloria_polaris	18	3	2.5	41.5
Boloria_selene	998	5	3.5	36.5
Boloria_thore	79	5	2.0	44.0
Boloria_titania	141	5	3.0	39.5
Borbo_borbonica	1	NA	4.5	29.0
Brenthis_daphne	323	5	3.5	47.0
Brenthis_hecate	190	5	3.0	40.0
Brenthis_ino	699	5	2.5	37.0
Brintesia_circe	416	5	4.5	73.0
Cacyreus_marshalli	33	NA	8.0	23.5
Callophrys_avis	37	5	3.0	35.5
Callophrys_rubi	1192	5	6.0	23.0
Carcharodus_alceae	615	5	8.0	30.0
Carcharodus_baeticus	56	5	4.0	30.0
Carcharodus_floccifera	277	5	4.5	30.0
Carcharodus_lavatherae	146	4	4.0	31.0
Carcharodus_orientalis	54	5	4.5	29.0
Carcharodus_stauderi	2	NA	8.0	30.0
Carcharodus_tripolinus	NA	5	7.0	30.0
Carterocephalus_palaemon	585	5	2.5	27.0
Carterocephalus_silvicola	222	5	2.5	25.0
Catopsilia_florella	NA	NA	11.0	50.0
Celastrina_argiolus	1190	5	7.0	27.0
Charaxes_jasius	127	5	6.5	79.5
Chazara_briseis	353	4	4.0	55.0
Chazara_prieuri	8	5	2.0	60.0
Coenonympha_arcania	736	5	3.5	37.0
Coenonympha_corinna	17	5	4.5	29.0
Coenonympha_dorus	107	5	3.0	31.0
Coenonympha_gardetta	61	5	4.0	31.0
Coenonympha_glycerion	574	5	3.0	28.0
Coenonympha_hero	173	3	3.5	30.0
Coenonympha_leander	27	5	3.5	33.0
Coenonympha_oedippus	52	5	3.0	38.0
Coenonympha_orientalis	11	NA	3.0	30.5
Coenonympha_pamphilus	1371	5	7.0	28.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Coenonympha_rhodopenis	39	5	2.5	33.0
Coenonympha_thyrsis	9	5	5.0	32.0
Coenonympha_tullia	553	5	2.0	31.5
Colias_alfacariensis	494	5	6.5	43.5
Colias_aurorina	14	5	5.0	55.0
Colias_caucasica	13	5	3.0	52.0
Colias_chrysotheme	36	3	7.0	44.0
Colias_crocea	1028	5	7.0	48.0
Colias_erate	138	5	4.5	49.0
Colias_hecla	24	4	3.0	43.0
Colias_hyale	682	5	6.5	45.0
Colias_myrmidone	94	1	5.5	47.0
Colias_palaeno	417	5	3.0	47.0
Colias_phicomone	83	4	3.5	45.0
Colias_tyche	6	5	3.0	45.0
Colotis_evagore	10	NA	9.0	33.0
Cupido_alcetas	146	5	7.0	29.0
Cupido_argiades	478	5	6.0	29.0
Cupido_decoloratus	67	5	5.0	25.0
Cupido_lorquini	17	5	3.0	25.0
Cupido_minimus	753	5	6.0	23.0
Cupido_osiris	131	5	6.0	27.0
Cyaniris_semiargus	930	5	6.0	29.0
Cyclus_webbianus	NA	5	NA	27.5
Danaus_chrysippus	38	NA	10.5	70.0
Danaus_plexippus	15	NA	11.0	95.5
Erebia_aethiopella	10	5	2.0	38.0
Erebia_aethiops	326	5	3.5	47.0
Erebia_albergana	65	5	3.0	43.0
Erebia_calcarius	9	5	3.0	38.0
Erebia_cassioides	65	5	3.0	37.0
Erebia_christi	1	3	2.5	38.0
Erebia_claudina	8	4	3.0	35.0
Erebia_disa	36	5	2.0	45.5
Erebia_embla	123	5	2.0	47.5
Erebia_epiphron	137	5	2.5	38.0
Erebia_epistygne	24	4	3.0	47.0
Erebia_eriphyle	34	5	3.0	34.0
Erebia_euryale	203	5	3.0	44.0
Erebia_flavofasciata	5	4	3.0	35.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Erebia_gorge	92	5	3.0	37.0
Erebia_gorgone	13	5	2.0	41.0
Erebia_hispania	17	5	2.5	38.0
Erebia_lefebvrei	12	5	3.0	44.0
Erebia_ligea	564	5	3.0	41.0
Erebia_manto	89	5	3.0	39.0
Erebia_medusa	361	5	3.5	38.0
Erebia_melampus	56	5	3.0	33.0
Erebia_melas	31	5	3.5	45.0
Erebia_meolans	139	5	4.0	46.0
Erebia_mnestra	22	5	2.0	36.0
Erebia_montana	38	5	3.0	47.0
Erebia_neoridas	48	5	2.5	41.0
Erebia_nivalis	14	5	1.5	32.0
Erebia_oeme	89	5	3.0	42.0
Erebia_orientalis	5	5	2.5	30.5
Erebia_ottomana	42	5	3.0	39.0
Erebia_palarica	5	5	3.0	58.0
Erebia_pandrose	194	5	2.5	40.0
Erebia_pharte	59	5	2.0	36.0
Erebia_pluto	51	5	2.5	45.0
Erebia_polaris	16	5	1.5	39.0
Erebia_pronoe	81	5	3.5	46.0
Erebia_rhodopensis	10	5	1.5	36.5
Erebia_rondoui	NA	5	2.0	38.0
Erebia_scipio	9	5	2.0	48.0
Erebia_sthenno	10	5	2.5	42.0
Erebia_stiria	17	5	3.0	49.0
Erebia_styx	25	5	3.0	51.0
Erebia_sudetica	13	3	2.5	28.5
Erebia_triarius	72	5	4.0	47.0
Erebia_tyndarus	25	5	3.0	35.0
Erebia_zapateri	6	5	3.5	38.0
Erynnis_marloyi	31	5	6.0	31.0
Erynnis_tages	842	5	4.0	30.0
Euchloe_ausonia	352	5	5.0	44.0
Euchloe_bazae	5	3	4.0	34.0
Euchloe_belemia	63	5	5.0	40.0
Euchloe_charltonia	NA	5	8.5	34.0
Euchloe_crameri	197	5	3.0	44.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Euchloe_eversi	NA	5	4.0	40.0
Euchloe_grancanariensis	NA	5	7.0	40.0
Euchloe_hesperidum	NA	5	6.0	40.0
Euchloe_insularis	16	5	5.0	34.5
Euchloe_penia	14	5	5.0	34.0
Euchloe_simplonia	32	5	4.0	43.0
Euchloe_tagis	56	5	3.0	35.0
Eumedonia_eumedon	441	5	4.0	28.0
Euphydryas_aurinia	538	5	3.5	36.5
Euphydryas_cynthia	58	5	3.0	37.0
Euphydryas_desfontainii	41	4	3.0	46.0
Euphydryas_iduna	24	4	2.0	41.0
Euphydryas_intermedia	28	5	3.0	40.0
Euphydryas_maturna	210	5	2.5	41.5
Fabriciana_adippe	888	5	3.5	53.5
Fabriciana_elisa	8	5	3.0	49.0
Fabriciana_niobe	646	4	2.5	49.5
Favonius_quercus	777	5	5.0	32.0
Freyeria_trochylus	19	5	8.0	16.5
Gegenes_nostrodamus	65	5	9.0	32.0
Gegenes_pumilio	76	5	9.0	32.0
Glaucopsyche_alexis	609	5	5.0	29.0
Glaucopsyche_melanops	103	5	2.0	27.0
Glaucopsyche_paphos	NA	5	NA	29.0
Gonepteryx_cleobule	NA	3	4.0	61.5
Gonepteryx_cleopatra	303	5	7.5	59.0
Gonepteryx_farinosa	50	5	11.0	60.0
Gonepteryx_maderensis	NA	2	9.0	61.5
Gonepteryx_rhamni	1177	5	8.0	58.0
Hamearis_lucina	497	5	6.0	32.5
Hesperia_comma	807	5	3.5	31.0
Heteropterus_morpheus	270	5	3.0	33.5
Hipparchia_aristaeus	13	5	4.5	52.0
Hipparchia_autonoe	NA	NA	2.0	54.0
Hipparchia_azorina	NA	5	5.0	41.0
Hipparchia_bacchus	NA	3	2.0	59.0
Hipparchia_blachieri	9	NA	4.5	52.0
Hipparchia_christenseni	1	5	2.0	51.0
Hipparchia_cretica	9	5	5.5	56.0
Hipparchia_cypriensis	NA	5	9.0	56.5

species	range.size	conserv.eu	FM_Average	WSP_Female_average
Hipparchia_fagi	309	4	4.5	66.0
Hipparchia_fatua	48	5	6.5	57.5
Hipparchia_fidia	92	5	3.5	59.0
Hipparchia_gomera	NA	5	5.0	59.0
Hipparchia_hermione	237	4	2.0	61.0
Hipparchia_leighebi	1	4	4.0	52.0
Hipparchia_maderensis	NA	5	3.0	44.0
Hipparchia_mersina	3	NA	4.5	51.0
Hipparchia_miguelensis	NA	5	4.0	41.0
Hipparchia_neapolitana	NA	5	3.0	NA
Hipparchia_neomiris	9	5	3.0	48.0
Hipparchia_pellucida	2	5	4.0	51.0
Hipparchia_sbordonii	NA	4	2.0	52.0
Hipparchia_semele	814	5	3.5	51.0
Hipparchia_senthes	56	5	7.0	52.0
Hipparchia_statilinus	360	4	4.0	45.0
Hipparchia_syriaca	54	5	5.5	65.0
Hipparchia_tamadabae	NA	5	6.0	55.5
Hipparchia_tilosi	NA	3	3.0	59.0
Hipparchia_volgensis	42	5	4.0	53.5
Hipparchia_wyssii	NA	5	3.0	59.0
Hyponephele_lupina	143	5	4.5	45.0
Hyponephele_lycaon	365	5	3.5	38.0
Iolana_debilitata	NA	NA	5.0	39.0
Iolana_iolas	102	4	4.0	39.0
Iphiclides_feisthamelii	NA	NA	7.5	77.0
Iphiclides_podalirius	755	5	6.0	77.0
Issoria_lathonia	976	5	7.0	42.5
Kirinia_climene	9	5	2.5	47.0
Kirinia_roxelana	86	5	6.5	60.0
Kretania_eurypilus	2	NA	2.0	29.5
Kretania_hesperica	8	5	4.0	30.0
Kretania_psylorita	5	5	2.0	24.5
Kretania_pylaon	16	NA	2.0	29.5
Kretania_sephirus	NA	5	NA	31.0
Kretania_trappi	6	NA	3.0	31.0
Laeosopis_roboris	82	5	3.0	27.0
Lampides_boeticus	361	5	9.0	33.0
Lasiommata_maera	888	5	5.5	47.5
Lasiommata_megera	1053	5	6.5	42.5

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Lasiommata_paramegaera	15	5	6.0	42.5
Lasiommata_petropolitana	352	5	3.5	38.0
Leptidea_duponcheli	67	5	5.0	38.0
Leptidea_juvernica	NA	NA	3.0	42.0
Leptidea_morsei	49	2	5.0	41.5
Leptidea_reali	NA	5	6.0	38.0
Leptidea_sinapis	1089	5	6.0	38.0
Leptotes_pirithous	287	5	8.0	25.0
Libythea_celtis	181	5	6.5	44.5
Limenitis_camilla	526	5	3.0	56.0
Limenitis_populi	529	4	2.5	77.5
Limenitis_reducta	410	5	5.0	50.0
Lopinga_achine	275	3	2.5	44.0
Luthrodes_galba	NA	NA	NA	20.0
Lycaena_alciphron	519	4	4.0	34.0
Lycaena_candens	NA	5	3.5	34.5
Lycaena_dispar	383	5	6.5	37.0
Lycaena_helle	148	5	6.0	24.0
Lycaena_hippothoe	689	4	4.5	30.5
Lycaena_ottomana	37	5	7.0	29.0
Lycaena_phlaeas	1340	5	9.5	26.5
Lycaena_thersamon	199	5	9.0	30.0
Lycaena_thetis	6	NA	2.0	27.5
Lycaena_tityrus	673	5	7.0	30.0
Lycaena_virgaureae	756	5	5.0	27.0
Lysandra_albicans	40	5	3.0	39.0
Lysandra_bellargus	601	5	7.0	31.0
Lysandra_coridon	575	4	3.0	33.0
Lysandra_corydonius	NA	NA	3.0	33.0
Lysandra_hispana	50	5	7.0	34.0
Maniola_chia	2	5	5.0	41.5
Maniola_cypricola	NA	5	4.0	NA
Maniola_halicarnassus	NA	4	3.0	44.5
Maniola_jurtina	1289	5	5.0	41.5
Maniola_megala	2	NA	3.5	41.5
Maniola_nurag	5	5	3.5	38.0
Maniola_telmessia	7	5	7.5	41.5
Melanargia_arge	33	5	2.0	53.0
Melanargia_galathea	802	5	3.5	47.5
Melanargia_ines	79	5	4.0	48.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Melanargia_lachesis	111	5	2.5	49.0
Melanargia_larissa	73	5	4.0	55.0
Melanargia_occitanica	85	5	2.5	51.0
Melanargia_pherusa	4	5	2.5	48.0
Melanargia_russiae	111	5	3.0	55.0
Melitaea_aetherie	26	5	2.5	44.0
Melitaea_arduinna	14	5	3.5	44.0
Melitaea_asteria	15	5	2.0	29.0
Melitaea_athalia	1011	5	3.5	35.5
Melitaea_aurelia	268	5	2.0	30.0
Melitaea_britomartis	99	4	3.0	33.0
Melitaea_celadussa	NA	NA	3.0	35.5
Melitaea_cinxia	673	5	4.0	35.5
Melitaea_deione	108	5	4.5	39.0
Melitaea_diamina	461	4	3.5	35.5
Melitaea_didyma	621	5	5.5	37.0
Melitaea_ornata	NA	NA	4.0	41.5
Melitaea_parthenoides	172	5	3.0	33.0
Melitaea_phoebe	521	5	4.5	44.5
Melitaea_trivia	260	4	5.0	33.0
Melitaea_varia	41	5	3.0	34.0
Minois_dryas	48	5	3.0	62.0
Muschampia_cribellum	7	4	3.0	29.0
Muschampia_proto	88	5	4.0	34.5
Muschampia_tessellum	22	5	4.5	33.5
Neptis_rivularis	150	5	3.5	52.0
Neptis_sappho	104	5	4.5	54.0
Nymphalis_antiope	910	5	5.5	67.5
Nymphalis_polychloros	845	3	6.5	62.0
Nymphalis_vauualbum	72	5	3.5	63.0
Nymphalis_xanthomelas	113	4	4.5	62.0
Ochlodes_sylvanus	1058	5	4.0	30.0
Oeneis_bore	19	5	1.5	43.0
Oeneis_glacialis	46	5	3.0	53.0
Oeneis_jutta	166	5	2.5	53.0
Oeneis_norna	54	4	2.0	47.0
Papilio_alexanor	49	5	4.0	64.0
Papilio_hospiton	14	5	3.0	76.0
Papilio_machaon	1224	5	6.5	75.0
Pararge_aegeria	1178	5	7.0	40.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Pararge_xiphia	NA	2	12.0	45.5
Pararge_xiphioides	NA	5	12.0	37.5
Parnassius_apollo	354	4	4.5	80.0
Parnassius_mnemosyne	371	5	3.0	58.0
Parnassius_phoebus	48	4	3.0	65.0
Pelopidas_thrax	1	NA	10.0	39.5
Phengaris_alcon	354	4	3.0	36.0
Phengaris_arion	522	2	4.0	36.0
Phengaris_nausithous	188	4	3.0	35.0
Phengaris_teleius	252	3	3.0	34.0
Pieris_balcana	NA	5	7.0	38.5
Pieris_brassicae	1353	5	7.0	57.0
Pieris_bryoniae	114	5	4.0	38.5
Pieris_cheiranthi	NA	2	12.0	62.5
Pieris_ergane	125	5	7.5	42.0
Pieris_krueperi	51	5	8.0	46.0
Pieris_mannii	203	5	7.5	43.0
Pieris_napi	1405	5	5.5	40.0
Pieris_rapae	1363	5	9.5	44.5
Plebejidea_loewii	3	NA	3.5	28.5
Plebejus_argus	991	5	4.0	22.5
Plebejus_argyrognomon	290	5	4.0	31.0
Plebejus_bellieri	10	5	3.0	23.0
Plebejus_idas	774	5	5.0	24.5
Polygonia_c-album	1098	5	6.5	46.0
Polygonia_egea	158	5	8.5	45.0
Polyommatus_admetus	57	5	3.0	34.0
Polyommatus_amandus	544	5	3.0	31.0
Polyommatus_aroaniensis	13	5	3.0	30.5
Polyommatus_celina	NA	NA	11.0	27.0
Polyommatus_damocles	NA	NA	2.5	31.5
Polyommatus_damon	163	4	2.0	32.0
Polyommatus_daphnis	305	5	3.0	35.0
Polyommatus_dolus	24	5	2.0	35.0
Polyommatus_dorylas	330	4	4.0	32.0
Polyommatus_eros	88	4	3.0	31.0
Polyommatus_escheri	167	5	3.0	28.0
Polyommatus_fabressei	11	5	3.0	30.5
Polyommatus_fulgens	27	5	2.0	32.0
Polyommatus_golgus	3	3	2.0	28.0

species	range.size	conserv.eu	FM_Average	WSP_Female_average
Polyommatus_humedasae	2	2	2.0	30.5
Polyommatus_icarus	1476	5	7.0	28.5
Polyommatus_iphigenia	2	NA	2.5	30.0
Polyommatus_nephohip- tenos	NA	4	2.0	30.5
Polyommatus_nivescens	26	4	4.0	33.0
Polyommatus_orphicus	9	3	NA	33.0
Polyommatus_ripartii	59	4	4.0	31.0
Polyommatus_thersites	351	5	7.0	29.0
Polyommatus_violetae	3	3	2.0	31.0
Pontia_callidice	60	5	4.0	47.0
Pontia_chloridice	11	5	6.0	38.5
Pontia_daplidice	921	5	5.5	41.5
Pontia_edusa	NA	5	5.5	41.5
Proterebia_phegea	5	NA	2.5	46.0
Pseudochazara_amymone	NA	3	2.5	53.0
Pseudochazara_anthelea	45	5	4.0	51.0
Pseudochazara_cingovskii	2	NA	2.0	52.0
Pseudochazara_euxina	NA	NA	3.0	54.5
Pseudochazara_geyeri	6	5	2.0	49.0
Pseudochazara_graeca	19	5	3.0	51.0
Pseudochazara_mercurius	6	NA	2.0	50.0
Pseudochazara_orestes	1	3	3.0	53.5
Pseudochazara_williamsi	5	NA	3.0	50.0
Pseudophilotes_abencerragus	27	5	2.0	20.0
Pseudophilotes_barbagiae	1	5	4.0	22.0
Pseudophilotes_baton	222	5	5.0	24.0
Pseudophilotes_bavius	20	5	3.0	27.0
Pseudophilotes_panoptes	41	4	6.0	21.5
Pseudophilotes_vicrama	212	4	5.0	23.0
Pyrgus_alveus	476	5	3.5	28.5
Pyrgus_andromedae	83	5	3.0	28.5
Pyrgus_armoricanus	311	5	5.5	26.0
Pyrgus_cacaliae	55	5	2.5	28.5
Pyrgus_carlinae	30	5	2.0	29.0
Pyrgus_carthami	264	5	5.0	32.0
Pyrgus_centaureae	162	5	2.5	29.5
Pyrgus_cinarae	14	5	4.0	31.0
Pyrgus_cirsii	94	3	3.0	27.0
Pyrgus_foulquieri	29	NA	3.0	28.5

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Pyrgus_malvae	959	5	5.0	23.0
Pyrgus_malvoides	NA	5	3.5	23.0
Pyrgus_onopordi	105	5	7.0	25.0
Pyrgus_serratulae	318	4	3.0	28.0
Pyrgus_sidae	77	5	4.0	35.0
Pyrgus_warrenensis	29	5	2.0	24.5
Pyronia_bathseba	104	5	4.5	37.0
Pyronia_cecilia	219	5	3.5	31.0
Pyronia_tithonus	515	5	3.5	36.0
Satyrium_acaciae	349	5	3.0	30.0
Satyrium_esculi	106	5	4.0	32.0
Satyrium_ilicis	586	5	4.0	34.0
Satyrium_ledereri	1	NA	3.5	29.0
Satyrium_pruni	408	5	3.0	31.5
Satyrium_spini	483	5	3.5	30.0
Satyrium_w-album	553	5	3.0	30.0
Satyrus_actaea	73	5	3.0	55.0
Satyrus_ferula	144	5	4.0	55.0
Scolitantides_orion	260	4	5.0	27.5
Speyeria_aglaja	1132	5	3.5	51.5
Spialia_orbifer	129	5	5.5	25.0
Spialia_phlomidis	25	5	4.0	27.0
Spialia_rosae	NA	NA	NA	20.0
Spialia_sertorius	380	5	7.0	24.0
Spialia_therapne	7	5	5.0	24.0
Tarucus_balkanicus	19	5	7.0	20.0
Tarucus_theophrastus	4	5	6.0	21.0
Thecla_betulae	628	5	4.5	35.0
Thymelicus_acteon	496	4	4.5	24.0
Thymelicus_christi	NA	5	9.0	24.0
Thymelicus_hyrax	10	5	3.0	32.5
Thymelicus_lineola	926	5	3.5	25.5
Thymelicus_sylvestris	832	5	4.5	26.5
Tomares_ballus	51	5	4.0	29.0
Tomares_callimachus	NA	NA	3.0	28.0
Tomares_nogelii	2	0	3.5	32.5
Turanana_taygetica	3	2	4.0	21.0
Vanessa_atalanta	1343	5	8.5	59.5
Vanessa_cardui	1373	5	8.0	54.0
Vanessa_virginiensis	12	NA	10.0	45.0

species	range.size	conserv.eu	FM_Aver- age	WSP_Female_aver- age
Vanessa_vulcania	NA	5	12.0	57.0
Ypthima_asterope	2	NA	7.5	30.0
Zegris_eupheme	36	4	4.0	48.5
Zerynthia_cassandra	44	NA	4.0	49.0
Zerynthia_cerisy	61	4	5.0	57.0
Zerynthia_cretica	7	5	4.5	52.5
Zerynthia_polyxena	215	5	4.0	49.0
Zerynthia_rumina	128	5	5.0	45.0
Zizeeria_karsandra	NA	NA	NA	22.0
Zizeeria_knysna	39	NA	9.0	22.0

```
# or specify which columns to remove
be %>%
  select(-(OWS_egg:OWS_adult))
```

species	range.size	conserv.eu	WSP_Fe- male_av- er- WSP_Fe- ELT_sin-	FM_Av- er-	AFB_Av- ey-	AFB_i-	AFB_min-
Aglais_nymphal- nusa- dae	2.00	0.02	0.047	0.057	0.00	0.00	0.00
Aglais_nymphal- i- dae	2.00	0.03	0.053	0.060	0.00	0.00	0.00
Aglais_nymphal- ticae- dae	2.00	0.03	0.048	0.070	0.00	0.00	0.00
Agraly-21 5 5	0.75	0.51	0.052	0.289	0.00	0.00	0.00
Agraly-2 4 4	1.00	0.01	0.025	0.577	0.00	0.00	0.00
Agraly-45 5 5	1.00	0.01	0.023	0.354	0.00	0.00	0.00

species	fam-	con-	serv-	cover-	GEN_Av-	male_av-	WSP_Fe-										FM_Av-			AFB_Av-			AFB_an-			
							er- WSP_Fe-	ELT_sin-	er-	ey-	i-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	
Agr-Ly-4805	5	1.00	0.01	0.00	0.025	0.8	0.208	1	1	0	0	1	0	0	0	2800	0.00	1	0	1	0	0	1	0		
adescapidae																										
tilete																										
Agr-Ly-635	5	1.00	0.01	0.00	0.026	0.4	0.258	N	N	N	N	N	N	N	N	1	0	0	800	1900	0.00	0	0	0	0	1
adescapidae																										
bit-																										
u-																										
lus																										
Agr-Ly-55	5	1.00	0.01	0.00	0.025	0.6	1.000	1	0	0	0	1	0	0	1800	N	N	N	1	0	0	0	0	0	1	
adescapidae																										
naicus																										
Agr-Ly-22	2	1.00	0.01	0.00	0.023	0.3	1.000	1	1	0	0	1	0	0	2400	0.00	1	0	0	0	0	0	0	0	0	
adescapidae																										
lichi																										
An-Pier-1245	5	1.00	0.01	0.00	0.040	0.5	0.101	0	1	0	0	1	0	0	0	2300	0.02	1	0	0	0	0	0	0	0	
thodaris_car-																										
damines																										
An-Pier-195	5	1.00	0.01	0.00	0.039	0.5	1.000	N	N	N	N	N	N	N	1	0	0	0	1300	0.02	1	0	0	0	0	
thodaris_da-																										
mone																										
An-Pier-1315	5	1.00	0.01	0.00	0.037	0.6	0.507	0	1	0	0	1	0	0	0	1800	0.51	1	0	0	0	0	0	0	0	
thodaris_eu-																										
phe-																										
noides																										
An-Pier-365	5	1.00	0.01	0.00	0.033	0.6	0.408	N	N	N	N	N	N	N	1	0	0	0	2300	0.04	1	0	0	0	0	
thodaris_gruneri																										
Ap-Ny-525	5	1.50	0.02	0.01	0.068	0.8	0.267	0	0	1	1	1	0	0	50	1850	0.53	1	0	0	1	1	1	1	1	
atura_ilia																										
dae																										
Ap-Ny-575	5	1.00	0.01	0.00	0.070	0.0	0.306	0	0	1	0	1	0	0	0	2300	0.51	1	0	0	1	1	1	1	1	
atura_iris																										
dae																										
Ap-Ny-475	5	1.50	0.02	0.01	0.062	0.4	1.000	0	0	1	1	1	0	0	0	650	1.00	1	0	1	1	1	1	1	1	
atura_metis																										
dae																										

species	range	size	con- serv	GEN_Av- er	WSP_Fe- male_av- er	WSP_Fe- range										ELT_sin- er			FM_Av- er			AFB_Av- er			AFB_an- i- AFB_min- AFB_max		
						GEN_min	GEN_max	WSP_min	WSP_max	WSP_avg	WSP_std	WSP_min	WSP_max	WSP_avg	WSP_std	ELT_min	ELT_max	ELT_avg	FM_min	FM_max	FM_avg	AFB_min	AFB_max	AFB_avg	AFB_min	AFB_max	AFB_avg
Aph-Ny-1005	15	1.00	0.01	0.00	0.38	0.57	0.06	3	1	1	0	0	1	1	0	0	200	3	0.00	1	0	1	0	0	0	0	
to- i-																											
pus- dy-																											
per-																											
an-																											
tus																											
Apo-Pie-8945	5	1.00	0.01	0.00	0.62	0.51	0.08	2	0	1	1	0	0	0	1	0	260	3	0.51	1	1	0	1	0	0	1	
ria- crataegi																											
Aras-Ny-6205	15	2.00	0.03	0.02	0.33	0.51	0.70	7	0	1	0	0	0	1	1	0	170	3	0.02	1	0	1	0	0	0	0	
nia- ilev-																											
ana- dae																											
Ar- Pa-134	5	1.00	0.01	0.00	0.57	0.6	0.57	7	0	1	0	0	0	1	0	0	90	3	0.53	1	0	0	0	0	0	0	
chom- pilapoli-																											
nus- ion-																											
idae																											
Are-Ny-2295	15	1.00	0.01	0.00	0.41	0.6	0.38	3	1	1	0	0	0	1	0	0	230	3	0.51	1	0	0	0	0	0	0	
sana- arethusa																											
dae																											
Arg-Ny-1005	14	1.00	0.01	0.00	0.55	0.10	0.77	7	0	1	0	0	0	0	0	0	230	3	0.00	0	0	1	0	0	0	1	
yn- i-																											
nis- daodice																											
Arg-Ny-3205	15	1.50	0.02	0.01	0.72	0.16	0.57	7	1	1	0	0	1	0	0	0	260	3	0.04	1	0	0	0	0	1	1	
yn- i-																											
nis- dan-																											
dora																											
Arg-Ny-1005	15	1.00	0.01	0.00	0.62	0.8	0.26	8	0	1	0	0	1	0	0	0	230	3	0.02	1	0	1	1	0	0	1	
yn- i-																											
nis- dae-																											
phia																											
Ari-Ly-7005	5	2.00	0.03	0.02	0.25	0.6	0.10	2	1	1	0	0	1	0	0	0	190	7	0.00	1	0	0	0	0	1	1	
cia- cagnidae																											
Ari-Ly-434	5	2.00	0.03	0.02	0.28	0.8	0.28	9	0	1	0	0	1	0	0	30	210	3	0.00	1	0	0	0	0	0	0	
cia- can-																											
nidae																											
teros																											
Ari-Ly-4355	5	1.00	0.01	0.00	0.27	0.57	0.06	6	1	1	0	0	1	0	0	0	220	4	0.00	1	0	0	0	0	0	0	
cia- can-																											
tax-																											
erxes																											

species	range	size	con- serv- er	GEN_Av- con- serv- er	WSP_Fe- male_av- er- WSP_Fe- range	ELT_sin- er- range	FM_Av- er- range	AFB_Av- ey- range	AFB_an- i- range	AFB_min- AFB_max											
Ari-Ly-1385	5	2.50	0.03	0.01	0.025	0.6	0.10	2	1	1	0	0	0	1	0	0	0	0	0	0	1
cia_caenidae																					
era																					
Ari-Ly-32	5	5	1.00	0.01	0.00	0.027	0.7	0.18	3	N	A	N	A	N	A	N	A	N	A	N	A
cia_caenidae																					
tensis																					
Ari-Ly-15	5	5	1.50	0.02	0.01	0.028	0.4	0.50	7	0	1	0	0	0	1	0	0	90	0	2	10
cia_caenidae																					
ro-																					
nen-																					
sis																					
Ari-Ly-78	5	5	1.00	0.01	0.00	0.025	0.5	0.70	7	0	1	0	0	0	1	0	0	30	0	2	0
cia_caenidae																					
Aza-Lys-N	N	A	N	A	3.03	0.00	0.021	0.5	0.28	0	N	A	N	A	N	A	N	A	N	A	N
souscaenidae																					
Aza-Lys-N	N	A	N	A	3.03	0.00	0.012	0.5	0.50	7	0	0	1	0	1	1	0	0	15	0	N
dus caenidae																					
Bol-Nym-175	5	1.00	0.01	0.00	0.036	0.8	0.28	9	1	1	0	0	0	1	0	0	100	1	90	2	0
ria_iaquilonaris																					
dae																					
Bol-Nym-224	14	1.00	0.01	0.00	0.038	0.8	0.35	N	A	N	A	N	A	N	A	N	A	N	A	N	A
ria_jehar-																					
i- dae																					
clea																					
Bol-Nym-55	5	2.00	0.03	0.02	0.033	0.2	0.40	7	0	1	0	0	0	1	0	0	0	200	0	5	3
ria_idia																					
dae																					
Bol-Nym-311	5	1.00	0.01	0.00	0.036	0.7	0.18	3	0	1	0	0	0	1	1	0	50	18	5	0	0
ria_ieu-																					
no- dae																					
mia																					
Bol-Nym-96	5	1.50	0.02	0.01	0.036	0.0	0.50	7	0	1	0	0	0	1	0	0	0	230	0	4	0
ria_ieu-																					
phro-																					
chyme																					
Bol-Nym-14	5	1.00	0.01	0.00	0.034	0.1	0.16	8	0	0	1	0	0	1	0	0	200	80	0	2	5
ria_ifreja																					
dae																					

species	isrange	fam- Nympha-	con- servat-	GEN_size	GEN_av- range	GEN_min	GEN_max	WSP_Fe- male_av- er- WSP_Fe-				ELT_sin- er- WSP_Fe-				FM_Av- er- WSP_Fe-				AFB_min- ey- i- AFB_min- AFB_max				AFB_an- AFB_max	AFB_min- AFB_max	
								er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-	er- WSP_Fe-			er- WSP_Fe-
Boldyrria_	145	5	1.00	0.01	0.00	0.42	5.11	0.70	7	0	0	1	0	1	0	0	100	50	2.00	1	0	0	0	0	0	0
Boldyrria_	375	5	1.00	0.01	0.00	0.36	6.8	1.00	0	0	1	0	0	1	0	0	750	1850	0.02	1	0	0	0	0	0	0
Boldyrria_	612	2	1.00	0.01	0.00	0.32	5.7	0.50	0	0	1	0	0	NAN	NAN	NAN	600	450	0.02	1	0	0	0	0	0	0
Boldyrria_	1125	5	1.00	0.01	0.00	0.39	6.6	0.36	4	1	1	0	0	1	0	0	0	2500	0.00	1	0	0	0	0	0	0
Boldyrria_	1015	5	1.00	0.01	0.00	0.36	6.8	0.26	8	0	1	0	0	1	0	0	1500	600	0.02	1	0	0	0	0	0	0
Boldyrria_	183	3	1.00	0.01	0.00	0.41	5.5	0.20	4	NAN	NAN	NAN	NAN	1	0	0	100	130	0.53	NAN	NAN	NAN	NAN	NAN	NAN	NAN
Boldyrria_	995	5	1.50	0.02	0.01	0.36	5.7	0.57	7	0	1	0	0	1	0	0	0	2200	0.53	1	0	0	0	0	0	1
Boldyrria_	795	5	1.25	0.01	0.51	0.44	6.6	0.57	7	0	1	0	0	1	0	0	300	1500	0.02	1	0	0	0	0	0	0
Boldyrria_	1414	5	1.00	0.01	0.00	0.39	5.9	0.50	0	0	1	0	0	1	0	0	100	200	0.00	1	0	0	0	0	0	0
Boldyrria_	113	NAN	2.50	0.03	0.01	0.29	6.2	0.36	3	1	1	0	0	1	0	0	0	100	4.51	1	0	0	0	0	0	0
Boldyrria_	325	5	1.00	0.01	0.00	0.47	6.10	0.49	7	0	0	1	0	1	0	0	0	2300	0.51	1	0	1	0	0	0	0
Boldyrria_	196	5	1.00	0.01	0.00	0.40	6.8	0.40	8	0	1	0	0	1	0	0	25	2275	0.00	1	0	0	0	0	0	0

species	range	size	con- serv	GEN_Av- con- serv	WSP_Fe- male_av- er- WSP_Fe- range	ELT_sin- er-	FM_Av- er-	AFB_Av- ey- i-	AFB_an- AFB_min-																					
Brin	Ny	695	5	1.00	0.01	0.00	0.37	0.8	0.20	4	1	1	0	0	0	1	1	0	0	200	2	51	1	0	1	0	0	0	0	
thisi- ino dae																														
Brin	Ny <th>416</th> <th>5</th> <th>1.00</th> <th>0.01</th> <th>0.00</th> <th>0.73</th> <th>0.4</th> <th>0.20</th> <th>4</th> <th>1</th> <th>1</th> <th>0</th> <th>0</th> <th>0</th> <th>0</th> <th>1</th> <th>0</th> <th>0</th> <th>230</th> <th>4</th> <th>53</th> <th>1</th> <th>0</th> <th>0</th> <th>0</th> <th>0</th> <th>1</th> <th>1</th> <th>1</th>	416	5	1.00	0.01	0.00	0.73	0.4	0.20	4	1	1	0	0	0	0	1	0	0	230	4	53	1	0	0	0	0	1	1	1
te- i- sia_																														
carce																														
Ca-Ly-33	NANA	3.00	3.00	0.00	0.23	0.5	1.00	NANA												150	8	00	1	0	0	0	0	0	0	
cyrenidae shalli																														
Cal-Ly-37	5	5	1.00	0.01	0.00	0.35	0.3	0.25												100	00	3.00	1	0	0	0	0	0	0	
lophyrusidae																														
Cal-Ly-119	2	5	1.25	0.01	0.50	0.52	3.0	0.00	0.03											230	0	02	1	0	1	1	0	0	0	
lophyrusidabi																														
CarHe-615	5	5	2.50	0.03	0.01	0.30	0.8	0.10	0.07											300	8	04	1	0	0	0	0	0	0	
charperi- o- idae dus_al- ceae																														
CarHe-56	5	5	2.50	0.03	0.01	0.30	0.4	0.40	0.08											500	110	04	1	0	0	0	0	0	1	
charperi- o- idae dus_baeti- cus																														
CarHe-277	4	5	1.50	0.02	0.01	0.30	0.4	0.10	0.04											200	4	51	1	0	0	0	0	0	1	
charperi- o- idae dus_floc- cifera																														
CarHe-146	4	1.00	0.01	0.00	0.31	0.6	0.40	0.08												160	0	02	1	0	0	0	0	0	1	
charperi- o- idae dus_lavatherae																														
CarHe-54	5	5	2.50	0.03	0.01	0.29	0.2	0.50												200	0	51	NANA	NANA	NANA	NANA	NANA	NANA	NANA	
charperi- o- idae dus_ori- en- talis																														

species	range	size	con- serv	GEN_Av- con- serv	WSP_Fe- male_av- er- WSP_Fe-	ELT_sin- er-	FM_Av- er-	AFB_Av- ey- i-	AFB_an- AFB_min-
CarHe2	NA	3.03	0.03	0.00	0.30	0.1	0.28	NA	NA
charperi- o- idae dus_staud- eri									
CarHeNA5	5	3.03	0.03	0.00	0.30	0.8	1.00	NA	NA
charperi- o- idae dus_tripoli- nus									
CarHe5855	5	1.00	0.01	0.00	0.27	0.6	0.10	6 0 1 0 0 1 0 0 0 180	2.51 1 0 0 0 0 0 0
ro- peri- cephalus mon									
CarHe225	5	1.00	0.01	0.00	0.25	0.6	0.20	0 0 1 0 0 1 0 0 0 500	2.51 1 0 0 0 0 0 0
ro- peri- cephalus vi- cola									
CatHeNA	NA	3.03	0.03	0.00	0.50	0.10	NA	0 0 1 1 1 1 0 0 200	1.2 NA
siliadato- rella									
CelaLy-1190	5	1.71	0.02	0.51	0.52	0.10	0.00	0 0 0 1 1 1 0 0 0 190	7.00 1 0 1 1 0 0 0
t- caenidae rina_ar- gi- o- lus									
ChaNy1871	5	1.50	0.02	0.01	0.79	0.5	0.10	2 0 0 0 1 1 1 0 0 240	6.53 0 0 0 0 0 0 1 1
siusi- dae									
ChaNy3531	4	1.00	0.01	0.00	0.55	0.26	0.30	3 1 1 0 0 1 1 0 0 250	1.04 1 0 0 0 0 0 1 1
ara_i-bri- seis dae									
ChaNy851	5	1.00	0.01	0.00	0.60	0.12	1.00	NA	NA
ara_i-prieuri dae									

species	con-fam-1	GEN_serv-2	GEN_serv-3	GEN_serv-4	GEN_serv-5	GEN_serv-6	GEN_serv-7	GEN_serv-8	GEN_serv-9	GEN_serv-10	GEN_serv-11	GEN_serv-12	GEN_serv-13	GEN_serv-14	GEN_serv-15	GEN_serv-16	GEN_serv-17	GEN_serv-18	GEN_serv-19	GEN_serv-20	GEN_serv-21	GEN_serv-22	GEN_serv-23	GEN_serv-24	GEN_serv-25	GEN_serv-26	GEN_serv-27	GEN_serv-28	GEN_serv-29	GEN_serv-30	GEN_serv-31	GEN_serv-32	GEN_serv-33	GEN_serv-34	GEN_serv-35	GEN_serv-36	GEN_serv-37	GEN_serv-38	GEN_serv-39	GEN_serv-40	GEN_serv-41	GEN_serv-42	GEN_serv-43	GEN_serv-44	GEN_serv-45	GEN_serv-46	GEN_serv-47	GEN_serv-48	GEN_serv-49	GEN_serv-50	GEN_serv-51	GEN_serv-52	GEN_serv-53	GEN_serv-54	GEN_serv-55	GEN_serv-56	GEN_serv-57	GEN_serv-58	GEN_serv-59	GEN_serv-60	GEN_serv-61	GEN_serv-62	GEN_serv-63	GEN_serv-64	GEN_serv-65	GEN_serv-66	GEN_serv-67	GEN_serv-68	GEN_serv-69	GEN_serv-70	GEN_serv-71	GEN_serv-72	GEN_serv-73	GEN_serv-74	GEN_serv-75	GEN_serv-76	GEN_serv-77	GEN_serv-78	GEN_serv-79	GEN_serv-80	GEN_serv-81	GEN_serv-82	GEN_serv-83	GEN_serv-84	GEN_serv-85	GEN_serv-86	GEN_serv-87	GEN_serv-88	GEN_serv-89	GEN_serv-90	GEN_serv-91	GEN_serv-92	GEN_serv-93	GEN_serv-94	GEN_serv-95	GEN_serv-96	GEN_serv-97	GEN_serv-98	GEN_serv-99	GEN_serv-100	GEN_serv-101	GEN_serv-102	GEN_serv-103	GEN_serv-104	GEN_serv-105	GEN_serv-106	GEN_serv-107	GEN_serv-108	GEN_serv-109	GEN_serv-110	GEN_serv-111	GEN_serv-112	GEN_serv-113	GEN_serv-114	GEN_serv-115	GEN_serv-116	GEN_serv-117	GEN_serv-118	GEN_serv-119	GEN_serv-120	GEN_serv-121	GEN_serv-122	GEN_serv-123	GEN_serv-124	GEN_serv-125	GEN_serv-126	GEN_serv-127	GEN_serv-128	GEN_serv-129	GEN_serv-130	GEN_serv-131	GEN_serv-132	GEN_serv-133	GEN_serv-134	GEN_serv-135	GEN_serv-136	GEN_serv-137	GEN_serv-138	GEN_serv-139	GEN_serv-140	GEN_serv-141	GEN_serv-142	GEN_serv-143	GEN_serv-144	GEN_serv-145	GEN_serv-146	GEN_serv-147	GEN_serv-148	GEN_serv-149	GEN_serv-150	GEN_serv-151	GEN_serv-152	GEN_serv-153	GEN_serv-154	GEN_serv-155	GEN_serv-156	GEN_serv-157	GEN_serv-158	GEN_serv-159	GEN_serv-160	GEN_serv-161	GEN_serv-162	GEN_serv-163	GEN_serv-164	GEN_serv-165	GEN_serv-166	GEN_serv-167	GEN_serv-168	GEN_serv-169	GEN_serv-170	GEN_serv-171	GEN_serv-172	GEN_serv-173	GEN_serv-174	GEN_serv-175	GEN_serv-176	GEN_serv-177	GEN_serv-178	GEN_serv-179	GEN_serv-180	GEN_serv-181	GEN_serv-182	GEN_serv-183	GEN_serv-184	GEN_serv-185	GEN_serv-186	GEN_serv-187	GEN_serv-188	GEN_serv-189	GEN_serv-190	GEN_serv-191	GEN_serv-192	GEN_serv-193	GEN_serv-194	GEN_serv-195	GEN_serv-196	GEN_serv-197	GEN_serv-198	GEN_serv-199	GEN_serv-200	GEN_serv-201	GEN_serv-202	GEN_serv-203	GEN_serv-204	GEN_serv-205	GEN_serv-206	GEN_serv-207	GEN_serv-208	GEN_serv-209	GEN_serv-210	GEN_serv-211	GEN_serv-212	GEN_serv-213	GEN_serv-214	GEN_serv-215	GEN_serv-216	GEN_serv-217	GEN_serv-218	GEN_serv-219	GEN_serv-220	GEN_serv-221	GEN_serv-222	GEN_serv-223	GEN_serv-224	GEN_serv-225	GEN_serv-226	GEN_serv-227	GEN_serv-228	GEN_serv-229	GEN_serv-230	GEN_serv-231	GEN_serv-232	GEN_serv-233	GEN_serv-234	GEN_serv-235	GEN_serv-236	GEN_serv-237	GEN_serv-238	GEN_serv-239	GEN_serv-240	GEN_serv-241	GEN_serv-242	GEN_serv-243	GEN_serv-244	GEN_serv-245	GEN_serv-246	GEN_serv-247	GEN_serv-248	GEN_serv-249	GEN_serv-250	GEN_serv-251	GEN_serv-252	GEN_serv-253	GEN_serv-254	GEN_serv-255	GEN_serv-256	GEN_serv-257	GEN_serv-258	GEN_serv-259	GEN_serv-260	GEN_serv-261	GEN_serv-262	GEN_serv-263	GEN_serv-264	GEN_serv-265	GEN_serv-266	GEN_serv-267	GEN_serv-268	GEN_serv-269	GEN_serv-270	GEN_serv-271	GEN_serv-272	GEN_serv-273	GEN_serv-274	GEN_serv-275	GEN_serv-276	GEN_serv-277	GEN_serv-278	GEN_serv-279	GEN_serv-280	GEN_serv-281	GEN_serv-282	GEN_serv-283	GEN_serv-284	GEN_serv-285	GEN_serv-286	GEN_serv-287	GEN_serv-288	GEN_serv-289	GEN_serv-290	GEN_serv-291	GEN_serv-292	GEN_serv-293	GEN_serv-294	GEN_serv-295	GEN_serv-296	GEN_serv-297	GEN_serv-298	GEN_serv-299	GEN_serv-300	GEN_serv-301	GEN_serv-302	GEN_serv-303	GEN_serv-304	GEN_serv-305	GEN_serv-306	GEN_serv-307	GEN_serv-308	GEN_serv-309	GEN_serv-310	GEN_serv-311	GEN_serv-312	GEN_serv-313	GEN_serv-314	GEN_serv-315	GEN_serv-316	GEN_serv-317	GEN_serv-318	GEN_serv-319	GEN_serv-320	GEN_serv-321	GEN_serv-322	GEN_serv-323	GEN_serv-324	GEN_serv-325	GEN_serv-326	GEN_serv-327	GEN_serv-328	GEN_serv-329	GEN_serv-330	GEN_serv-331	GEN_serv-332	GEN_serv-333	GEN_serv-334	GEN_serv-335	GEN_serv-336	GEN_serv-337	GEN_serv-338	GEN_serv-339	GEN_serv-340	GEN_serv-341	GEN_serv-342	GEN_serv-343	GEN_serv-344	GEN_serv-345	GEN_serv-346	GEN_serv-347	GEN_serv-348	GEN_serv-349	GEN_serv-350	GEN_serv-351	GEN_serv-352	GEN_serv-353	GEN_serv-354	GEN_serv-355	GEN_serv-356	GEN_serv-357	GEN_serv-358	GEN_serv-359	GEN_serv-360	GEN_serv-361	GEN_serv-362	GEN_serv-363	GEN_serv-364	GEN_serv-365	GEN_serv-366	GEN_serv-367	GEN_serv-368	GEN_serv-369	GEN_serv-370	GEN_serv-371	GEN_serv-372	GEN_serv-373	GEN_serv-374	GEN_serv-375	GEN_serv-376	GEN_serv-377	GEN_serv-378	GEN_serv-379	GEN_serv-380	GEN_serv-381	GEN_serv-382	GEN_serv-383	GEN_serv-384	GEN_serv-385	GEN_serv-386	GEN_serv-387	GEN_serv-388	GEN_serv-389	GEN_serv-390	GEN_serv-391	GEN_serv-392	GEN_serv-393	GEN_serv-394	GEN_serv-395	GEN_serv-396	GEN_serv-397	GEN_serv-398	GEN_serv-399	GEN_serv-400	GEN_serv-401	GEN_serv-402	GEN_serv-403	GEN_serv-404	GEN_serv-405	GEN_serv-406	GEN_serv-407	GEN_serv-408	GEN_serv-409	GEN_serv-410	GEN_serv-411	GEN_serv-412	GEN_serv-413	GEN_serv-414	GEN_serv-415	GEN_serv-416	GEN_serv-417	GEN_serv-418	GEN_serv-419	GEN_serv-420	GEN_serv-421	GEN_serv-422	GEN_serv-423	GEN_serv-424	GEN_serv-425	GEN_serv-426	GEN_serv-427	GEN_serv-428	GEN_serv-429	GEN_serv-430	GEN_serv-431	GEN_serv-432	GEN_serv-433	GEN_serv-434	GEN_serv-435	GEN_serv-436	GEN_serv-437	GEN_serv-438	GEN_serv-439	GEN_serv-440	GEN_serv-441	GEN_serv-442	GEN_serv-443	GEN_serv-444	GEN_serv-445	GEN_serv-446	GEN_serv-447	GEN_serv-448	GEN_serv-449	GEN_serv-450	GEN_serv-451	GEN_serv-452	GEN_serv-453	GEN_serv-454	GEN_serv-455	GEN_serv-456	GEN_serv-457	GEN_serv-458	GEN_serv-459	GEN_serv-460	GEN_serv-461	GEN_serv-462	GEN_serv-463	GEN_serv-464	GEN_serv-465	GEN_serv-466	GEN_serv-467	GEN_serv-468	GEN_serv-469	GEN_serv-470	GEN_serv-471	GEN_serv-472	GEN_serv-473	GEN_serv-474	GEN_serv-475	GEN_serv-476	GEN_serv-477	GEN_serv-478	GEN_serv-479	GEN_serv-480	GEN_serv-481	GEN_serv-482	GEN_serv-483	GEN_serv-484	GEN_serv-485	GEN_serv-486	GEN_serv-487	GEN_serv-488	GEN_serv-489	GEN_serv-490	GEN_serv-491	GEN_serv-492	GEN_serv-493	GEN_serv-494	GEN_serv-495	GEN_serv-496	GEN_serv-497	GEN_serv-498	GEN_serv-499	GEN_serv-500	GEN_serv-501	GEN_serv-502	GEN_serv-503	GEN_serv-504	GEN_serv-505	GEN_serv-506	GEN_serv-507	GEN_serv-508	GEN_serv-509	GEN_serv-510	GEN_serv-511	GEN_serv-512	GEN_serv-513	GEN_serv-514	GEN_serv-515	GEN_serv-516	GEN_serv-517	GEN_serv-518	GEN_serv-519	GEN_serv-520	GEN_serv-521	GEN_serv-522	GEN_serv-523	GEN_serv-524	GEN_serv-525	GEN_serv-526	GEN_serv-527	GEN_serv-528	GEN_serv-529	GEN_serv-530	GEN_serv-531	GEN_serv-532	GEN_serv-533	GEN_serv-534	GEN_serv-535	GEN_serv-536	GEN_serv-537	GEN_serv-538	GEN_serv-539	GEN_serv-540	GEN_serv-541	GEN_serv-542	GEN_serv-543	GEN_serv-544	GEN_serv-545	GEN_serv-546	GEN_serv-547	GEN_serv-548	GEN_serv-549	GEN_serv-550	GEN_serv-551	GEN_serv-552	GEN_serv-553	GEN_serv-554	GEN_serv-555	GEN_serv-556	GEN_serv-557	GEN_serv-558	GEN_serv-559	GEN_serv-560	GEN_serv-561	GEN_serv-562	GEN_serv-563	GEN_serv-564	GEN_serv-565	GEN_serv-566	GEN_serv-567	GEN_serv-568	GEN_serv-569	GEN_serv-570	GEN_serv-571	GEN_serv-572	GEN_serv-573	GEN_serv-574	GEN_serv-575	GEN_serv-576	GEN_serv-577	GEN_serv-578	GEN_serv-579	GEN_serv-580	GEN_serv-581	GEN_serv-582	GEN_serv-583	GEN_serv-584	GEN_serv-585	GEN_serv-586	GEN_serv-587	GEN_serv-588	GEN_serv-589	GEN_serv-590	GEN_serv-591	GEN_serv-592	GEN_serv-593	GEN_serv-594	GEN_serv-595	GEN_serv-596	GEN_serv-597	GEN_serv-598	GEN_serv-599	GEN_serv-600	GEN_serv-601	GEN_serv-602	GEN_serv-603	GEN_serv-604	GEN_serv-605	GEN_serv-606	GEN_serv-607	GEN_serv-608	GEN_serv-609	GEN_serv-610	GEN_serv-611	GEN_serv-612	GEN_serv-613	GEN_serv-614	GEN_serv-615	GEN_serv-616	GEN_serv-617	GEN_serv-618	GEN_serv-619	GEN_serv-620	GEN_serv-621	GEN_serv-622	GEN_serv-623	GEN_serv-624	GEN_serv-625	GEN_serv-626	GEN_serv-627	GEN_serv-628	GEN_serv-629	GEN_serv-630	GEN_serv-631	GEN_serv-632	GEN_serv-633	GEN_serv-634	GEN_serv-635	GEN_serv-636	GEN_serv-637	GEN_serv-638	GEN_serv-639	GEN_serv-640	GEN_serv-641	GEN_serv-642	GEN_serv-643	GEN_serv-644	GEN_serv-645	GEN_serv-646	GEN_serv-647	GEN_serv-648	GEN_serv-649	GEN_serv-650	GEN_serv-651	GEN_serv-652	GEN_serv-653	GEN_serv-654	GEN_serv-655	GEN_serv-656	GEN_serv-657	GEN_serv-658	GEN_serv-659	GEN_serv-660	GEN_serv-661	GEN_serv-662	GEN_serv-663	GEN_serv-664	GEN_serv-665	GEN_serv-666	GEN_serv-667	GEN_serv-668	GEN_serv-669	GEN_serv-670	GEN_serv-671	GEN_serv-672	GEN_serv-673	GEN_serv-674	GEN_serv-675	GEN_serv-676	GEN_serv-677	GEN_serv-678	GEN_serv-679	GEN_serv-680	GEN_serv-681	GEN_serv-682	GEN_serv-683	GEN_serv-684	GEN_serv-685	GEN_serv-686	GEN_serv-687	GEN_serv-688	GEN_serv-689	GEN_serv-690	GEN_serv-691	GEN_serv-692	GEN_serv-693	GEN_serv-694	GEN_serv-695	GEN_serv-696	GEN_serv-697	GEN_serv-698	GEN_serv-699	GEN_serv-700	GEN_serv-701	GEN_serv-702	GEN_serv-703	GEN_serv-704	GEN_serv-705	GEN_serv-706	GEN_serv-707	GEN_serv-708	GEN_serv-709	GEN_serv-710	GEN_serv-711	GEN_serv-712	GEN_serv-713	GEN_serv-714	GEN_serv-715	GEN_serv-716	GEN_serv-717	GEN_serv-718	GEN_serv-719	GEN_serv-720	GEN_serv-721	GEN_serv-722	GEN_serv-723	GEN_serv-724	GEN_serv-725	GEN_serv-726	GEN_serv-727	GEN_serv-728	GEN_serv-729	GEN_serv-730	GEN_serv-731	GEN_serv-732	GEN_serv-733	GEN_serv-734	GEN_serv-735	GEN_serv-736	GEN_serv-737	GEN_serv-738	GEN_serv-739	GEN_serv-740	GEN_serv-741	GEN_serv-742	GEN_serv-743	GEN_serv-744	GEN_serv-745	GEN_serv-746	GEN_serv-747	GEN_serv-748	GEN_serv-749	GEN_serv-750	GEN_serv-751	GEN_serv-752	GEN_serv-753	GEN_serv-754	GEN_serv-755	GEN_serv-756	GEN_serv-757	GEN_serv-758	GEN_serv-759	GEN_serv-760	GEN_serv-761	GEN_serv-762	GEN_serv-763	GEN_serv-764	GEN_serv-765	GEN_serv-766	GEN_serv-767	GEN_serv-768	GEN_serv-769	GEN_serv-770	GEN_serv-771	GEN_serv-772	GEN_serv-773	GEN_serv-774	GEN_serv-775	GEN_serv-776	GEN_serv-777	GEN_serv-778	GEN_serv-779	GEN_serv-780	GEN_serv-781	GEN_serv-782	GEN_serv-783	GEN_serv-784	GEN_serv-785	GEN_serv-786	GEN_serv-787	GEN_serv-788	GEN_serv-789	GEN_serv-790	GEN_serv-791	GEN_serv-792	GEN_serv-793	GEN_serv-794	GEN_serv-795	GEN_serv-796	GEN_serv-797	GEN_serv-798	GEN_serv-799	GEN_serv-800	GEN_serv-801	GEN_serv-802	GEN_serv-803	GEN_serv-804	GEN_serv-805	GEN_serv-806	GEN_serv-807	GEN_serv-808	GEN_serv-809	GEN_serv-810	GEN_serv-811	GEN_serv-812	GEN_serv-813	GEN_serv-814	GEN_serv-815	GEN_serv-816	GEN_serv-817	GEN_serv-818	GEN_serv-819	GEN_serv-820	GEN_serv-821	GEN_serv-822	GEN_serv-823	GEN_serv-824	GEN_serv-825	GEN_serv-826	GEN_serv-827	GEN_serv-828	GEN_serv-829	GEN_serv-830	GEN_serv-831	GEN_serv-832	GEN_serv-833	GEN_serv-834	GEN_serv-835	GEN_serv-836	GEN_serv-837	GEN_serv-838	GEN_serv-839	GEN_serv-840	GEN_serv-841	GEN_serv-842	GEN_serv-843	GEN_serv-844	GEN_serv-845	GEN_serv-846	GEN_serv-847	GEN_serv-848	GEN_serv-849	GEN_serv-850	GEN_serv-851	GEN_serv-852	GEN_serv-853	GEN_serv-854	GEN_serv-855	GEN_serv-856	GEN_serv-857	GEN_serv-858	GEN_serv-859	GEN_serv-860	GEN_serv-861	GEN_serv-862	GEN_serv-863	GEN_serv-864	GEN_serv-865	GEN_serv-866	GEN_serv-867	GEN_serv-868	GEN_serv-869	GEN_serv-870	GEN_serv-871	GEN_serv-872	GEN_serv-873	GEN_serv-874	GEN_serv-875	GEN_serv-876	GEN_serv-877	GEN_serv-878	GEN_serv-879	GEN_serv-880	GEN_serv-881	GEN_serv-882	GEN_serv-883	GEN_serv-884	GEN_serv-885	GEN_serv-886	GEN_serv-887	GEN_serv-888	GEN_serv-889	GEN_serv-890	GEN_serv-891
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					WSP_Fe-								FM_Av-		AFB_Av-		AFB_an-								
	fam-	con-	GEN_Av-	male_av-	er- WSP_Fe-	ELT_sin-	er-	er-	ey-	i-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-					
species	range	size	age	GEN	AV	WSP_Fe	ELT	sin	er	er	er	er	er	er	er	er	er	er	er	er					
Coenonympha	55	5	1.00	0.01	0.00	0.31	0.10	0.50	1	0	0	1	0	0	0	140	2.02	1	0	1	0	0	0	0	
lia i-																									
dae																									
Co-Pieris	45	5	2.50	0.03	0.01	0.43	0.30	0.10	0.7	1	1	0	0	1	0	0	0	260	0.51	1	0	0	0	0	0
l- dae																									
ias_al-																									
facarien-																									
sis																									
Co-Pieris	14	5	5	1.00	0.01	0.00	0.55	0.20	0.5	0	1	0	0	1	0	0	450	1.95	0.00	0	0	1	0	0	0
l- dae																									
ias_au-																									
ro-																									
r-																									
ina																									
Co-Pieris	13	5	5	1.00	0.01	0.00	0.52	0.40	0.7	0	1	0	0	1	0	0	900	1.40	0.00	1	0	0	0	0	0
l- dae																									
ias_cau-																									
ca-																									
sica																									
Co-Pieris	36	3	3	2.50	0.03	0.01	0.44	0.30	0.4	0	1	1	0	0	1	0	0	150	0.00	1	0	0	0	0	0
l- dae																									
ias_chrysotheme																									
Co-Pieris	12	5	3.00	0.03	0.00	0.48	0.12	0.00	1	0	1	0	0	1	0	0	0	300	0.04	1	0	0	0	0	0
l- dae																									
ias_cro-																									
cea																									
Co-Pieris	13	5	2.50	0.03	0.01	0.49	0.60	0.10	NANANANANANA	1	0	0	0	1	0	0	200	0.51	NANANANANANANA						
l- dae																									
ias_er-																									
ate																									
Co-Pieris	24	4	4	1.00	0.01	0.00	0.43	0.30	0.7	1	0	0	0	1	1	0	0	900	0.00	1	0	0	0	0	0
l- dae																									
ias_hecla																									
Co-Pieris	6	5	2.50	0.03	0.01	0.45	0.10	0.20	0.4	1	1	0	0	1	0	0	0	180	0.51	1	0	0	0	0	0
l- dae																									
ias_hyale																									

species	range	size	con- serv	GEN_Av- er	GEN_Min	GEN_Max	WSP_Fe- male_av- er	WSP_Fe- male_Range	HIS_Min	HIS_Max	EVE_Min	EVE_Max	WTA_Min	WTA_Max	ELT_sin- er	FM_Av- er	FM_Min	FM_Max	AFB_Min	AFB_Max	AFB_an- ey-i-	AFB_min- AFB_max	AFB_low- AFB_high	AFB_power			
Co-Pie- l- ias_my- mi- done	94	2	1	2.50	0.03	0.01	0.47	0.6	0.30	6	0	1	0	0	1	0	0	0	500	5.51	1	0	0	0	0	0	
Co-Pie- l- ias_palaeno	417	5	1	0.01	0.00	0.04	7.0	0.70	7	1	1	0	0	1	0	0	0	2500	0.00	1	0	1	0	0	0	0	
Co-Pie- l- ias_ph- icomone	83	4	4	1.25	0.01	0.50	5.45	0.10	0.16	9	1	0	0	0	1	0	0	900	1600	1	0	0	0	0	0	0	
Co-Pie- l- ias_ty- che	61	5	5	1.00	0.01	0.00	0.45	0.10	0.28	9	1	0	0	0	1	0	0	0	700	3.00	1	0	0	0	0	0	0
Col-Pie- tis_dagore	10	NANA	3	0.03	0.00	0.03	3.6	0.70	7	0	1	0	0	1	0	0	0	400	9.00	1	0	1	0	0	0	0	
Cu-Ly-146 pidcaenidae	146	5	2.50	0.03	0.01	0.29	0.6	0.18	3	0	1	0	0	1	0	0	0	1000	7.00	1	0	0	0	0	0	0	
Cu-Ly-478 pidcaenidae	478	5	2.00	0.02	0.00	0.29	0.2	0.07	2	0	1	0	0	1	0	0	0	1600	0.00	1	0	0	0	0	0	0	
Cu-Ly-67 pidcaenidae	67	4	5	2.50	0.03	0.01	0.25	0.2	0.26	8	0	1	0	0	NANA	NANA	0	1200	0.00	1	0	0	0	0	0	0	
Cu-Ly-17 pidcalonidamii	17	5	5	1.00	0.01	0.00	0.25	0.6	1.00	0	0	1	0	0	NANA	NANA	100	1900	0.00	1	0	0	0	0	0	1	
Cu-Ly-753 pidcaenidae	753	5	1.50	0.02	0.01	0.23	0.4	0.10	5	0	1	0	0	1	0	0	0	2800	0.00	1	0	0	0	0	1	1	
Cu-Ly-1315 pidcaenidae	1315	5	1.50	0.02	0.01	0.27	0.6	0.28	9	0	1	0	0	1	0	0	0	200	1800	0.00	1	0	0	0	0	0	1

[illegible]

	con- fam- species	GEN_size range	Av- size	WSP_Fe- male_av- er- WSP_Fe-	ELT_sin- er-	FM_Av- er-	AFB_min- ey- i- AFB_min-	AFB_max- ey- i- AFB_max-	AFB_an- power				
Ere-Ny- bia_i-disa dae	36	0.50	0.50	0.045	0.57	NANANANANANANANANA	A300	200	2.00	NANANANANANANANA			
Ere-Ny- bia_i-em- bla dae	18	1.00	0.01	0.00	0.47	0.57	0.20	4 0 1 0 0	NANANA	100	300	2.00	NANANANANANANANA
Ere-Ny- bia_i-epiphron dae	18	0.75	0.51	0.00	0.53	0.8	0.20	4 0 1 0 0 0 1 0 0	35	235	2.51	1 0 0 0 0 0 0	
Ere-Ny- bia_i-epistygne dae	24	1.00	0.01	0.00	0.47	0.6	1.00	NANANANANANANANANA	A400	1150	1.00	1 0 0 0 0 0 0	
Ere-Ny- bia_i-eri- phyllae	34	0.50	0.50	0.50	0.034	0.0	0.500	0 1 0 0	NANANA	1200	500	1.00	1 0 0 0 0 0 0
Ere-Ny- bia_i-eu- ryaldae	20	0.75	0.51	0.00	0.544	0.0	0.096	0 1 0 0 1 0 0	600	1900	1.02	1 0 0 0 0 0 0	
Ere-Ny- bia_i-flavo- fas-dae	5	0.50	0.50	0.50	0.035	0.2	1.00	NANANANANANA	A1 0 0	1800	3.00	1 0 0 0 0 0 0	
Ere-Ny- bia_i-gorge dae	9	0.50	0.50	0.50	0.037	0.6	0.30	6 0 1 0 0	NANANA	1600	500	1.00	NANANANANANANANA
Ere-Ny- bia_i-igor- gonidae	13	1.00	0.01	0.00	0.041	0.2	0.57	NANANANANANANANANA	A1500	500	2.00	1 0 0 0 0 0 0	
Ere-Ny- bia_i-his- panidae	17	1.00	0.01	0.00	0.038	0.8	1.00	NANANANANANANANANA	A1650	1250	2.51	1 0 0 0 0 0 1	
Ere-Ny- bia_i-lefeb- vreidae	19	1.00	0.01	0.00	0.044	0.8	0.70	NANANANANANA	A1 0 0	1600	400	1.00	NANANANANANANANA
Ere-Ny- bia_i-ligea dae	56	0.75	0.51	0.00	0.541	0.0	0.183	1 1 0 0 0 1 0 0 0	2500	1.02	1 0 0 0 0 0 0	1	

species	range	size	con- serva- tion	WSP_Fe-										FM_Av-					AFB_Av-					AFB_an-				
				GEN_Av-	male_av-	er- WSP_Fe-	ELT_sin-	er-	ey-	i-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-
EreNympha- bia_imanto- dae	89	5	0.50	0.50	0.039	0.10	0.30	6	0	1	0	0	1	0	0	900	1600	1	0	0	0	0	0	0	0	0	0	0
EreNympha- bia_imedusa- dae	36	5	0.75	0.51	0.00	0.53	8.0	0.20	4	1	1	0	0	1	0	0	200	2350	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_imelam- pus dae	56	5	1.00	0.01	0.00	0.03	3.0	0.28	0	NAN	NAN	NAN	NAN	NAN	NAN	NAN	800	1600	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_imelas- dae	31	5	1.00	0.01	0.00	0.04	5.0	1.00	0	NAN	NAN	NAN	NAN	NAN	NAN	NAN	200	2600	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_imel- olandae	139	5	1.00	0.01	0.00	0.04	6.0	0.20	0	1	1	0	0	1	0	0	150	2250	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_imnes- tra dae	22	5	0.75	0.51	0.00	0.03	6.0	0.50	0	0	1	0	0	NAN	NAN	NAN	1500	1000	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_imon- tanadae	38	5	1.00	0.01	0.00	0.04	7.0	0.30	4	1	0	0	0	NAN	NAN	NAN	1100	1400	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_in- ori-dae	48	5	1.00	0.01	0.00	0.04	1.0	0.28	9	0	1	0	0	1	0	0	500	1100	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_ini- valisdae	14	5	0.50	0.50	0.00	0.03	2.0	1.00	0	NAN	NAN	NAN	NAN	NAN	NAN	NAN	1	0	0	2100	100	1	0	0	0	0	0	0
EreNympha- bia_ioeme- dae	89	5	0.75	0.51	0.00	0.54	2.0	0.10	0	1	1	0	0	1	0	0	800	1800	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_iori- en-dae	5	5	1.00	0.01	0.00	0.03	0.5	0.28	0	NAN	NAN	NAN	NAN	NAN	NAN	NAN	1800	200	1	0	0	0	0	0	0	0	0	0
EreNympha- bia_iot- tomdae	42	5	1.00	0.01	0.00	0.03	9.0	0.70	7	NAN	NAN	NAN	NAN	NAN	NAN	NAN	450	2150	1	0	0	0	0	0	0	0	0	0

species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380
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[illegible]

species	range	size	con- serv	GEN_Av- er	WSP_Fe-		ELT_sin- er	FM_Av- er	AFB_Av- er	AFB_an- i	AFB_min- AFB_max		
					male_av- er	WSP_Fe- range							
Eu-Pier- chloa- narien- sis	NA5	5	2.02	0.02	0.04	0.8	1.0	NANANANANANANANA	50	190	0.0	NANANANANANANA	
Eu-Pier- chloa- peridum	NA5	5	2.02	0.02	0.04	0.8	0.28	NANANANANANANANA	0	406	0.0	1 0 0 0 0 0 0	
Eu-Pier- chloa- su- laris	NA5	5	1.75	0.52	0.05	34.3	0.26	0 0 1 0 0 0 0	130	0.0	1 0 0 0 0 0 0	0	
Eu-Pier- chloa- pe- nia	NA5	5	1.50	0.02	0.01	0.34	0.4	0.8 1 1 0 0 0 0	210	0.0	1 0 0 0 0 0 0	0	
Eu-Pier- chloa- plo- nia	NA5	5	0.75	0.51	0.05	43.6	0.36	3 1 1 0 0 0 1	100	0.0	1 0 0 0 0 0 0	0	
Eu-Pier- chloa- tagis	NA5	5	1.00	0.01	0.00	0.35	0.10	0.57 1 1 1 0 1 0	160	0.0	1 0 0 0 0 0 0	0	
Eu-Ly-4415 me-caenidae	NA5	5	1.00	0.01	0.00	0.28	0.8	0.20 8 1 1 0 0 0	240	0.0	1 0 0 0 0 0 0	0	
Eu-Ny-5385 phydryas_au- rinidae	NA5	5	1.00	0.01	0.00	0.36	0.10	0.2 1 1 0 0 0 0	260	0.53	1 0 0 0 0 0 0	0	
Eu-Ny-5851 phydryas_cyn- thiidae	NA5	5	0.75	0.51	0.05	37.0	0.28	9 1 1 0 0 0 1	90	0.20	0.0	1 0 0 0 0 0 0	0
Eu-Ny-4114 phydryas_des- fontiidae	NA4	4	1.00	0.01	0.00	0.46	0.12	1.00 0 1 0 0 0 0	280	0.0	1 0 0 0 0 0 0	0	
Eu-Ny-2414 phydryas_iduna dae	NA4	4	1.00	0.01	0.00	0.41	0.8	0.30 6 0 1 0 0 0	300	0.02	0.0	NANANANANANANA	0

species	range	size	con- fam-	serv- com-	GEN- con-	WSP_Fe-		WSP_Fe- er-	ELT_sin-				FM_Av-				AFB- ey-				AFB_an-						
						male_av-	er-		WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-	WSP_Fe-				
Eu-Ny-285	phyl- dryas_in- ter-dae	5	0.75	0.51	0.05	0.54	0.0	0.57	7	1	0	1	0	0	1	1	140	100	0	1	0	0	0	0	0	0	
Eu-Ny-210	phyl- dryas_matur- na dae	5	0.75	0.51	0.05	0.54	1.5	0.0	6	0	1	1	1	0	0	1	100	100	2.5	1	0	0	1	0	0	0	
Fab-Ny-885	ciana_adippe- dae	5	1.00	0.01	0.00	0.53	5	0.5	0	0	1	0	0	0	1	0	0	230	100	5.3	1	0	1	0	0	0	1
Fab-Ny-815	ciana_elisa- dae	5	1.00	0.01	0.00	0.49	6	1.00	0	0	1	0	0	1	0	0	400	160	0	0	1	0	0	0	0	0	
Fab-Ny-645	ciana_niobe- dae	4	1.00	0.01	0.00	0.49	5	0.4	0	8	1	1	0	0	1	0	0	250	100	5.3	1	0	0	0	0	0	0
Fav-Ly-775	niuscaquid- cus	5	1.00	0.01	0.00	0.32	6	0.4	0	8	0	0	0	1	1	0	0	200	100	0.2	0	0	0	1	0	1	1
Frey-Ly-19	e-caenidae	5	3.0	0.03	0.00	0.16	5	0.7	0	7	N	N	N	N	N	N	N	0	100	0	1	0	0	0	0	0	0
Geg-Hes-65	tro-peri- daniae	5	3.0	0.03	0.00	0.32	0	0.2	8	9	0	1	0	0	1	0	0	190	100	0	1	0	0	0	0	0	1
Geg-Hes-76	peri- idae	5	3.0	0.03	0.00	0.32	0	0.3	5	4	0	1	0	0	1	0	0	180	100	0	1	0	0	0	0	0	0
Gla-Ly-605	cop-syaenidae	5	1.00	0.01	0.00	0.29	8	0.0	6	5	0	1	0	0	1	0	0	190	100	0	1	0	0	0	0	1	1
Gla-Ly-1035	cop-syaenidae	5	1.00	0.01	0.00	0.27	0	0.2	4	0	1	0	0	1	0	0	100	100	2	0	1	0	0	0	0	0	1

[illegible]

species	range	size	con- serva- tion	GEN_Av- er- age	WSP_Fe- male_av- er- WSP_Fe- range	WSP_Fe- range	ELT_sin- er- age	FM_Av- er- age	AFB_Av- er- age	AFB_min- i- AFB_max	AFB_an- AFB_min- AFB_max
HipNymphal5	1.00	0.01	0.00	0.052.04	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_blachieri											
dae											
HipNymphal5	1.00	0.01	0.00	0.051.06	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_chris-											
tensdae											
HipNymphal5	1.00	0.01	0.00	0.056.08	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_cret-											
ica dae											
HipNymphal5	1.00	0.01	0.00	0.056.53	0.40	0.08	1	1	0	0	0
pardhia_cy-											
priedae											
sis											
HipNymphal4	1.00	0.01	0.00	0.066.08	0.26	0.00	1	1	0	0	0
pardhia_fagi											
dae											
HipNymphal5	1.00	0.01	0.00	0.057.55	0.36	0.04	1	1	0	0	0
pardhia_fatua											
dae											
HipNymphal5	1.00	0.01	0.00	0.059.06	0.10	0.04	0	1	0	0	0
pardhia_fidia											
dae											
HipNymphal5	1.00	0.01	0.00	0.059.06	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_gomera											
dae											
HipNymphal4	1.00	0.01	0.00	0.061.00	0.40	0.08	1	1	0	0	0
pardhia_hermione											
dae											
HipNymphal4	1.00	0.01	0.00	0.052.04	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_leighebi											
dae											
HipNymphal5	1.00	0.01	0.00	0.044.08	NA	0	0	1	0	0	0
pardhia_maderen-											
sis dae											
HipNymphal5	1.00	0.01	0.00	0.051.06	0.28	0.00	0.00	0.00	0.00	0.00	0.00
pardhia_mersina											
dae											

species	range	size	con- serva- tion	GEN_Av- er- age	WSP_Fe- male_av- er- WSP_Fe-	WSP_Fe- male_av- er- WSP_Fe-										FM_Av- er-	AFB_Av- er-	AFB_an- i-	AFB_min- power			
						GEN_Av- er- age	WSP_Fe- male_av- er- WSP_Fe-	ELT_sin- er-	FM_Av- er-	AFB_Av- er-	AFB_an- i-	AFB_min- power										
HipNympha- pardhia_migue- len-dae sis	NA	5	1.00	01.00.041.6	1.00	0	0	0	0	0	0	0	0	0	0	0	0					
HipNympha- pardhia_neapoli- tanadae	NA	5	1.00	01.00.0	0	0	0	0	0	0	0	0	0	0	0	0	0					
HipNympha- pardhia_neomiris dae	NA	5	1.00	01.00.048.0	1.00	0	0	0	0	0	0	0	0	0	0	0	0					
HipNympha- pardhia_pel- lu- dae cida	NA	5	1.00	01.00.051.0	0.289	1	1	0	0	1	0	0	0	100	0.02	1	0	0	0	0	1	0
HipNympha- pardhia_sbor- donidae	NA	4	1.00	01.00.052.0	0.289	0	0	0	0	0	0	0	0	0	200	0.00	0	0	0	0	0	0
HipNympha- pardhia_semele dae	NA	5	1.00	01.00.051.0	0.103	1	1	0	0	1	0	0	0	200	0.53	1	1	1	0	1	0	0
HipNympha- pardhia_sen- thesdae	NA	5	1.00	01.00.052.0	1.00	0	0	0	0	0	0	0	0	0	220	0.02	1	0	0	0	0	0
HipNympha- pardhia_statil- i- dae nus	NA	4	1.00	01.00.045.0	0.103	1	1	0	0	1	0	0	0	250	0.04	1	0	1	0	0	1	1
HipNympha- pardhia_syr- i- dae aca	NA	5	1.00	01.00.065.0	0.289	1	1	0	0	1	0	0	0	200	0.55	0	0	0	0	1	0	0
HipNympha- pardhia_tamad- abaeae	NA	5	1.00	01.00.055.5	0.289	0	0	0	0	0	0	0	0	0	400	0.00	0	0	0	0	0	0
HipNympha- pardhia_tilosi dae	NA	3	1.00	01.00.059.0	0.289	0	0	0	0	0	0	0	0	0	400	0.00	0	0	0	0	0	0

	con- fam-	GEN_Av- serv-comer-	WSP_Fe- male_av- er- WSP_Fe-	ELT_sin- er-	FM_Av- er-	AFB_AFB_an- ey- i- AFB_min-
Hip-Nyn-105al-5 pardhia_vol- gen-dae sis	1.00	0.01	0.053.59	1.000	1 1 0 0 1 0 0 0 2500	0.02 1 0 0 0 0 0 0
Hip-Nyn-145al-5 pardhia_wys- sii dae	1.00	0.01	0.059.6	0.289	1 1 0 0 NANANA	14003.00 NANANANANANA
Hy-Nyn-145al-5 ponphele_lupina dae	1.00	0.01	0.045.6	0.169	1 1 0 0 1 0 0 0 2300	0.55 1 0 0 1 1 0 0
Hy-Nyn-365al-5 ponphele_ly- caoridae	1.00	0.01	0.038.8	0.204	0 1 0 0 1 0 0 0 2500	0.53 1 0 0 0 0 0 0
Iola-Ly-NA bil-caenidae i-tata	NANANA	1.50	0.51.50.039.6	NANANANANANANANANA	8001300	1 0 0 0 0 0 0 0
Iola-Ly-1024 las caenidae	4	1.50	0.51.50.039.6	0.707	1 1 0 0 1 0 0 100	17000 1 0 0 0 0 0 1
Iph-Pa-NANANA i-pil-clidion-feisthamelii idae	3.03	0.03	0.077.26	0.408	0 0 1 0 1 0 0 0 2700	0.51 1 0 0 0 0 0 0
Iph-Pa-755 i-pil-clidion-po- daliriidae ius	5	2.00	0.03.02.077.26	0.105	1 1 0 0 1 0 0 0 2000	0.04 1 0 1 0 0 1 0
Is- Nyn-976al-5 so-i-ria_dath- o-nia	2.00	0.03	0.042.5	0.408	1 1 0 0 1 0 0 0 2750	0.06 1 0 0 0 0 0 1
Kirin-Nyn-976al-5 i-dae	1.00	0.01	0.047.2	0.707	1 1 0 0 1 0 0 700	1102.51 1 0 1 0 0 0 0

[illegible]

species	fam-	con- serv-	GEN_ size	Av- size	GEN_ range	Av- range	WSP_Fe-										FM_Av-				AFB_Av-				AFB_an-			
							er- WSP_Fe-	ELT_ sin-	er-	ey-	i-	AFB_ min-	er- WSP_Fe-	ELT_ sin-	er-	ey-	i-	AFB_ min-	er- WSP_Fe-	ELT_ sin-	er-	ey-	i-	AFB_ min-				
La-Nymphal5	15	5	3.03	0.03	0.00	0.42	5	0.35	4	0	1	0	0	0	1	0	0	0	1500	0.00	1	0	0	0	0	0	0	0
sioni-																												
matdapa-																												
matdapa-																												
La-Nymphal5	35	5	1.50	0.02	0.01	0.38	6	0.26	8	0	1	0	0	0	1	0	0	100	1250	0.53	1	0	0	0	0	0	1	
sioni-																												
matdapa-																												
matdapa-																												
LepPie67	5	5	2.00	0.02	0.00	0.38	8	0.40	8	1	1	0	0	0	1	0	0	0	2400	0.00	1	0	0	0	0	0	0	0
tideda-																												
tideda-																												
LepPieNANA	1.00	0.01	0.00	0.42	0	NA	0	0	1	0	0	0	1	0	0	NANA	3.00	1	0	1	0	0	0	0	0	0	0	
tideda-																												
tideda-																												
ver-																												
nica																												
LepPie49	4	2	2.00	0.02	0.00	0.41	5	0.50	7	0	1	0	0	0	1	0	0	0	1400	0.00	1	0	0	0	0	0	1	
tideda-																												
tideda-																												
sei																												
LepPieNA	5	5	2.00	0.03	0.02	0.38	0	1.00	0	0	1	0	0	0	1	0	0	0	2000	0.04	0	0	1	1	1	1	1	
tideda-																												
tideda-																												
ali																												
LepPie1089	5	5	2.00	0.03	0.02	0.38	0	0.10	4	0	1	0	0	0	1	0	0	0	2000	0.04	1	0	0	0	0	0	1	
tideda-																												
tideda-																												
LepLy-2875	5	5	3.03	0.03	0.00	0.25	2	0.00	5	0	1	0	0	0	1	0	0	0	1900	0.00	1	0	1	0	0	0	0	
toteda-																												
toteda-																												
hous																												
LibyNymphal5	16	5	1.25	0.01	0.50	0.54	4.5	0.70	7	0	0	0	1	1	0	0	0	1800	0.53	1	0	0	0	0	0	1		
i-																												
dae																												
Li-Nymphal5	50	5	1.00	0.01	0.00	0.56	8	0.28	9	0	0	1	1	1	0	0	0	1500	0.02	1	1	1	1	1	1	1	1	
meni-																												
tis_damilla																												
Li-Nymphal4	50	5	1.00	0.01	0.00	0.77	5.11	0.50	7	0	0	0	1	1	0	0	100	1550	0.51	0	0	0	0	0	1	1	0	
meni-																												
tis_dap-																												
uli																												
Li-Nymphal5	10	5	2.00	0.03	0.02	0.50	8	0.50	7	0	0	1	0	1	0	0	0	1950	0.04	1	0	1	1	1	1	1	1	
meni-																												
tis_dae																												
ducta																												

species	Ly-range	N	pop-size	con-serv	GEN-size	Av-GEN	male_av-er- WSP_Fe-	WSP_Fe-										FM_Av-				AFB_Av-				AFB_an-			
								WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	WSP_Fe-range	WSP_Fe-min	WSP_Fe-max	
Lop-Nyctali-	273	3	1.00	0.01	0.04	4.0	0.08	6	1	0	0	0	1	0	0	100	140	2	51	1	0	0	1	1	0	1			
Lut-caenidae	NANA	3	1.00	0.03	0.00	0.02	0.0	0.28	9	NANA	NANA	NANA	NANA	NANA	NANA	0	800	NANA	NANA	NANA	NANA	NANA	NANA	NANA	NANA	NANA			
Ly-Ly-5195	4	1.00	0.01	0.00	0.03	4.0	0.57	7	1	1	0	0	1	0	0	0	2500	1000	1	0	0	0	0	0	0	0			
Ly-Ly-NA5	5	1.00	0.01	0.00	0.03	4.5	1.00	0	1	0	0	0	1	1	0	900	1500	51	1	0	0	0	0	0	0				
Ly-Ly-3835	5	2.00	0.03	0.02	0.03	7.0	0.40	8	1	1	0	0	1	1	0	0	1000	651	1	0	1	1	0	0	0				
Ly-Ly-1482	5	1.25	0.01	0.50	5.2	4.0	0.28	9	0	1	0	0	1	0	0	100	1700	600	1	0	1	0	0	0	0				
Ly-Ly-6895	4	1.00	0.01	0.00	0.03	0.5	0.28	9	1	1	0	0	1	0	0	0	2500	1051	1	0	0	0	0	0	0				
Ly-Ly-375	5	2.00	0.02	0.00	0.02	9.0	1.00	0	NANA	NANA	NANA	NANA	NANA	NANA	0	1600	702	1	0	0	0	0	0	0	0				
Ly-Ly-1345	5	2.00	0.03	0.02	0.02	6.5	1	0.30	3	1	0	0	0	1	0	0	2400	1051	1	0	1	0	0	1	1				
Ly-Ly-1995	5	2.00	0.03	0.02	0.03	0.0	0.08	8	NANA	NANA	NANA	NANA	1	0	0	0	2200	104	1	0	0	0	0	0	0				
Ly-Ly-6	NANA	1.00	0.01	0.00	0.02	7.5	0.70	7	NANA	NANA	NANA	NANA	NANA	NANA	1500	800	2.00	1	0	0	0	0	0	0	0				
Ly-Ly-6735	5	2.00	0.03	0.02	0.03	0.0	0.10	6	1	1	0	0	1	0	0	0	2500	700	1	0	0	0	0	0	0				
Ly-Ly-7565	5	1.00	0.01	0.00	0.02	7.0	0.40	8	1	0	0	0	1	0	0	200	2300	600	1	0	0	0	0	0	0				

species	range	size	con- serv	GEN_Av- con- serv	WSP_Fe-		ELT_sin- er-	FM_Av- er-	AFB_Av- ey-	AFB_an- i-	AFB_min- power														
					male_av- er- WSP_Fe-	WSP_Fe- range																			
Lys-40 dra_cac- bi- cans	5	5	1.00	0.01	0.03	9.6	1.00	0	1	0	0	NAN	ANA500	100	0	1	0	0	0	0	1				
Lys-60 dra_cac- largus	15	5	2.00	0.03	0.02	0.31	6	0.18	3	1	0	0	0	1	0	0	100	190	7	0	0	1	1		
Lys-57 dra_cac- don	4	4	1.50	0.02	0.01	0.33	6	1.00	0	1	0	0	0	1	0	0	100	240	0	0	0	0	1	1	
Lys-NA dra_cac- do- nius	NA	1	0.01	0.01	0.00	0.33	6	NA	0	1	1	0	0	1	0	0	0	290	0	0	0	0	0	0	
Lys-50 dra_cac- pana	5	5	2.00	0.02	0.00	0.34	0	1.00	0	0	1	0	0	1	0	0	100	900	7	0	0	0	0	1	
ManNym- iola i- chia dae	5	5	1.00	0.01	0.00	0.41	5	0.28	9	1	1	0	0	1	1	0	0	800	5	0	0	0	0	0	
ManNym- iola i- cypri- coladae	5	5	1.00	0.01	0.00	0	NAN	0.28	9	1	1	0	0	1	1	0	NAN	4	0	0	1	0	0	0	
ManNym- iola i- hali- car-dae nas- sus	NA	4	1.00	0.01	0.00	0.44	5	0.28	9	1	1	0	0	1	1	0	0	450	3	0	0	0	0	0	
ManNym- iola i- ju- rtinalae	5	5	1.00	0.01	0.00	0.41	5	0.28	9	1	1	0	0	0	1	0	0	250	0	0	1	0	0	0	
ManNym- iola i- megala dae	NA	NA	1.00	0.01	0.00	0.41	5	0.28	9	1	1	0	0	1	1	0	0	900	3	5	3	1	0	0	0
ManNym- iola i- nurag dae	5	5	1.00	0.01	0.00	0.38	0	1.00	0	1	1	0	0	1	1	0	400	900	3	5	1	0	0	0	0

species	range	size	con- serva- tion	GEN_Av- er- age	WSP_Fe- male_av- er- WSP_Fe- range	GEN_Min	GEN_Max	WSP_Min	WSP_Max	ELT_Min	ELT_Max	FM_Av- er- age	AFB_Av- er- age	AFB_Min	AFB_Max	AFB_an- i- AFB_min- AFB_max	AFB_pow- er				
ManNymphal5	1.00	0.01	0.00	0.41.5	0.354	1	1	0	0	1	1	0	0	1300	55	1	0	0	0	0	0
iolai-telme- sia dae																					
MelNymphal5	1.00	0.01	0.00	0.53.6	0.289	NANANANANANANANANA						300	120	2	100	1	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.47.5	0.107	1	1	0	0	1	1	0	0	2500	53	1	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.48.0	0.500	0	1	0	0	NANANA	0	2600	100	1	0	0	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.49.8	0.196	1	1	0	0	1	0	0	0	1600	51	1	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.55.0	0.707	1	1	0	0	1	0	0	0	2400	02	1	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.51.0	0.164	1	1	0	0	1	0	0	0	2000	51	1	0	0	0	0	0
nar-i- gia_dae																					
c- i- tan- ica																					
MelNymphal5	1.00	0.01	0.00	0.48.0	0.289	NANANANANANANANANA						600	800	2.51	1	0	0	0	0	0	0
nar-i- gia_dae																					
MelNymphal5	1.00	0.01	0.00	0.55.0	0.100	1	1	0	0	1	0	0	500	190	1	0	0	0	0	0	0
nar-i- gia_dae																					
siae																					
MelNymphal5	1.50	0.02	0.01	0.44.0	0.408	NANANANANANA	0	1	1	0	1800	2.51	1	0	0	0	0	0	0	1	
taei- aetherie dae																					

[illegible]

	con- fam- serv-comer- srange	GEN_Av- comer- ringsize	WSP_Fe- male_av- er- WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range	WSP_Fe- Range
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[illegible]

species	range	size	con- fam- serv	GEN- com- size	WSP_Fe- male_av- er- WSP_Fe- HSL_Fe- VEW_Fe- TFW_Fe- ELT- sin- FI- FA- MI- FM- PA- PA- FE- B- SA- B- al- sh- power										FM_Av- er-				AFB- ey- i- AFB- an- AFB- min-																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
					GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size	GEN- com- size

species	fam- range	con- serv- size	GEN_Av- con- size	WSP_Fe- male_av- er- WSP_Fe- range	ELT_sin- er- range	FM_Av- er- range	AFB_Av- ey- range	AFB_an- i- range	AFB_min- AFB_max- power	WSP_Fe- range															
										1	2	3	4	5	6	7	8	9	10						
Pieris-1145 oniadae	5	1.50	0.02	0.01	0.38	5.13	0.20	4	1	0	0	0	1	1	0	600	2700	1	0	0	0	0	0	0	
Pieris-1149 thi dae	2	3.00	0.03	0.00	0.62	5	0.28	9	1	1	1	0	0	1	1	200	1200	1	0	0	0	0	0	0	
Pieris-1255 gandae	5	2.00	0.03	0.02	0.42	0.12	0.40	8	1	1	0	0	1	0	0	0	2200	755	1	0	0	0	0	0	1
Pieris-1315 dae	5	4.00	0.04	0.00	0.46	0.8	0.70	7	0	1	0	0	1	0	0	0	2000	100	1	0	0	0	0	0	0
Pieris-1335 nii dae	5	3.00	0.03	0.00	0.43	0.6	0.40	8	1	1	0	0	1	0	0	0	2000	755	1	0	0	0	0	0	0
Pieris-1405 dae	5	2.00	0.03	0.02	0.40	0.16	0.10	4	1	1	0	0	1	0	0	0	2500	557	1	0	1	0	0	0	0
Pieris-1463 pae dae	5	2.00	0.03	0.02	0.44	5.11	0.10	8	1	1	0	0	0	1	0	0	3000	51	1	0	0	0	0	0	1
Ple-Ly-3 be- caenidae	NANA	1.00	0.01	0.00	0.28	5	0.70	7	NANA	NANA	NANA	NANA	NANA	NANA	NANA	0	3000	51	1	0	0	0	0	0	0
jidea_loewii																									
Ple-Ly-9915 be- caenidae	5	1.50	0.02	0.01	0.22	5	0.06	9	1	1	0	0	1	0	0	0	2400	100	1	0	0	0	0	1	1
jus_ar- gus																									
Ple-Ly-2905 be- caenidae	5	1.50	0.02	0.01	0.31	0.6	0.20	4	0	1	0	0	1	0	0	0	300	1400	1	0	0	0	0	0	0
jus_ar- gy- rog- nomon																									
Ple-Ly-105 be- caenidae	5	1.00	0.01	0.00	0.23	0.6	0.35	4	NANA	NANA	NANA	NANA	NANA	NANA	NANA	0	1400	100	1	0	0	0	0	0	0
jus_bel- lieri																									
Ple-Ly-7745 be- caenidae	5	1.50	0.02	0.01	0.24	5	0.00	1	0	1	0	0	1	0	0	0	100	2300	1	0	0	0	0	0	0
jus_idas																									
Poly-Nympha- go- i- nia_dae	15	2.00	0.03	0.02	0.46	0.12	0.06	0	0	1	1	1	1	0	0	0	2700	557	1	0	1	1	1	1	1
album																									

species	family	range	size	con-	GEN_Av-	WSP_Fe-	male_av-	er-	WSP_Fe-	ELT_sin-	er-	FM_Av-	AFB_Av-	AFB_an-	AFB_min-											
PolyNympha- go-i- nia_daga	155	5	2.00	0.03	0.02	0.45	0.2	0.50	7	0	1	0	0	1	1	0	0	2100	8.55	1	0	0	0	0	0	0
PolyLy-57	5	5	1.00	0.01	0.00	0.34	0.8	0.70	7	1	1	0	0	NANANA	100	1700	1.00	1	0	0	0	0	0	0	0	0
ommaenidae tus_ad- me- tus																										
PolyLy-544	5	5	1.50	0.02	0.01	0.31	0.6	0.20	4	1	1	0	0	1	0	0	100	2000	1.00	1	0	0	0	0	0	1
ommaenidae tus_aman- dus																										
PolyLy-13	5	5	1.00	0.01	0.00	0.30	0.5	1.00	0	0	1	0	0	1	0	0	400	1600	1.00	NANANANANANANA						
ommaenidae tus_aroanien- sis																										
PolyLy-NANANA	4	00	0.04	0.00	0.27	0.12	1.00	NANANANANANANANANA	0	2800	1.0	1	0	0	0	0	0	0	0	1						
ommaenidae tus_celina																										
PolyLy-NANANA	1	00	0.01	0.00	0.31	0.5	NANANANANANANANANANA	1700	300	2.51	NANANANANANANANA															
ommaenidae tus_damo- cles																										
PolyLy-1634	4	4	1.00	0.01	0.00	0.32	0.4	0.40	7	1	0	0	0	1	0	0	600	1800	1.00	1	0	0	0	0	0	1
ommaenidae tus_da- mon																										
PolyLy-305	5	5	1.00	0.01	0.00	0.35	0.6	0.10	9	1	1	0	0	1	0	0	200	1800	1.00	1	0	0	0	0	0	1
ommaenidae tus_daph- nis																										
PolyLy-24	5	5	1.00	0.01	0.00	0.35	0.6	1.00	NANANANANA	1	0	0	0	200	800	2.00	1	0	0	0	0	0	0	0	0	0
ommaenidae tus_do- lus																										

species	range	size	con-	fam-	serv-	com-	GEN_Av-	GEN_Min-	GEN_Max-	WSP_Fe-	male_av-	er-	WSP_Fe-	ELT_sin-	er-	FM_Av-	AFB_Av-	AFB_i-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-	AFB_min-	AFB_max-	AFB_an-
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species	range	size	con-	GEN_Av-	WSP_Fe-	male_av-	er- WSP_Fe-	ELT_sin-	FM_Av-	AFB_Av-	AFB_an-	AFB_min-															
family	service	cover	GEN_Av-	WSP_Fe-	male_av-	er- WSP_Fe-	ELT_sin-	FM_Av-	AFB_Av-	AFB_an-	AFB_min-	AFB_min-															
PolyLy-NA4	4	1.00	0.01	0.00	0.30	5	1.00	NANANANANANANANA	1200	2.00	NANANANANANANA	NANANANANANANA															
ommaenidae																											
tus_nepho-																											
hip-																											
ta-																											
menos																											
PolyLy-26	4	4	1.00	0.01	0.00	0.33	6	1.00	0	1	1	0	0	0	1	0	0	0	0	0	1						
ommaenidae																											
tus_nivescens																											
PolyLy-9	3	3	1.00	0.01	0.00	0.33	6	0.57	NANANANANANANANA	400	160	NANANANANANANANANA	NANANANANANANANANA														
ommaenidae																											
tus_or-																											
phi-																											
cus																											
PolyLy-59	5	4	1.00	0.01	0.00	0.31	6	0.40	1	1	0	0	1	0	0	100	190	1.00	1	0	0	0	0	0	0		
ommaenidae																											
tus_ri-																											
par-																											
tii																											
PolyLy-35	15	5	2.00	0.03	0.02	0.29	6	0.50	0	1	1	0	0	1	0	0	0	220	700	1.00	1	0	0	0	0	0	0
ommaenidae																											
tus_ther-																											
sites																											
PolyLy-3	3	3	1.00	0.01	0.00	0.31	6	1.00	0	0	1	0	0	NANANA	1200	2.00	1	0	0	1	0	0	1	0	0	1	
ommaenidae																											
tus_vi-																											
o-																											
le-																											
tae																											
PonPie60	5	5	1.50	0.02	0.01	0.47	10	0.10	2	1	0	0	0	1	0	0	0	340	400	1.00	1	0	0	0	0	0	0
tia_dad-																											
lidice																											
PonPie11	5	5	2.50	0.03	0.01	0.38	3	0.20	6	0	1	0	0	1	0	0	0	250	60	0.04	NANANANANANANANA	NANANANANANANANA					
tia_dad-																											
ridice																											
PonPie92	15	5	3.00	0.03	0.00	0.41	5	0.06	1	0	1	0	0	1	1	0	0	300	5	0.53	1	0	0	0	0	0	0
tia_dap-																											
lidice																											

[illegible]

	con- fam- serv- con- GEN_Av- male_av- er- WSP_Fe- ELT_sin- FM_Av- AFB_Av- AFB_an- AFB_min-															
species	range	size	GEN_Av- male_av- er- WSP_Fe- ELT_sin- FM_Av- AFB_Av- AFB_an- AFB_min-													
Pseudocampidocidae	1	1.00	0.01	0.05	0.04	1.00	NANANANANANANANANA	1400	1.00	1	0	0	0	0	0	0
ara_mercurius	3	1.00	0.01	0.05	0.3	0.28	NANANANANANANANANA	300	1.00	1	0	0	0	0	0	0
Pseudocampidocidae	1	1.00	0.01	0.05	0.04	NANANANANANANANANA	200	1.00	1	0	0	0	0	0	0	1
ara_williamsi	5	1.50	0.02	0.01	0.20	0.36	4 0 1 0 0 NANANANA	100	1.00	1	0	0	0	0	0	1
Pseudocampidocidae	1	1.00	0.01	0.05	0.04	1.00	0 0 1 0 0 NANANANA	700	1.00	1	0	0	0	0	0	0
Pseudocampidocidae	5	1.50	0.02	0.01	0.24	0.10	4 0 1 0 0 1 0 0 100	190	1.00	1	0	0	0	0	0	0
Pseudocampidocidae	5	1.00	0.01	0.05	0.27	0.57	7 0 1 0 0 1 0 0 500	100	1.00	1	0	1	0	0	0	0
Pseudocampidocidae	4	2.00	0.02	0.00	0.21	0.50	NANANANANANANANANA	200	1.00	1	0	0	0	0	0	1
Pseudocampidocidae	4	1.50	0.02	0.01	0.23	0.06	9 0 1 0 0 NANANANA	0	200	1.00	1	0	0	0	0	0
PyrHesgus palveusidae	5	1.00	0.01	0.05	0.28	0.36	4 0 1 0 0 1 0 0 0 230	1.53	1	0	0	0	0	0	0	0
PyrHesgus penidromidae	5	1.00	0.01	0.05	0.28	0.28	NANANANANANANANANA	160	1.00	1	0	0	0	0	0	0

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species	range	pop_size	GEN_av- con- serv	GEN_av- com- er	WSP_Fe-		WSP_Fe- male_av- er								ELT_sin-				FM_Av- er				AFB_av- ey-i-				AFB_av- an- AFB_min-			
					GEN_Fe- min	GEN_Fe- max	WSP_Fe- min	WSP_Fe- max	WSP_Fe- min	WSP_Fe- max	WSP_Fe- min	WSP_Fe- max	WSP_Fe- min	WSP_Fe- max	ELT_sin- min	ELT_sin- max	ELT_sin- min	ELT_sin- max	FM_Av- min	FM_Av- max	FM_Av- min	FM_Av- max	AFB_av- min	AFB_av- max	AFB_av- min	AFB_av- max	AFB_min- min	AFB_min- max		
PyrHes318	4	1.00	0.01	0.00	0.28	0.30	0	1	1	0	0	1	0	0	0	2800	0.02	1	0	0	0	0	0	0	0	0				
gus_pari- rat-idae																														
u- lae																														
PyrHes77	5	5	1.00	0.01	0.00	0.35	0.36	N	N	N	N	N	N	N	N	N	0	2300	0.02	1	0	0	0	0	0	1				
gus_psi- dae																														
idae																														
PyrHes29	5	5	1.00	0.01	0.00	0.24	0.57	N	N	N	N	N	N	N	N	N	1800	0.02	0	N	N	N	N	N	N	N				
gus_pwi- renidae																														
sis																														
Py-Nyn104	5	1.00	0.01	0.00	0.37	0.36	0	1	1	0	0	1	0	0	100	1900	0.51	1	0	0	0	0	0	0	0	0				
ro-i- nia_dath- seba																														
Py-Nyn219	5	1.00	0.01	0.00	0.31	0.17	0	1	0	0	1	0	0	0	2300	0.51	1	0	0	0	0	0	0	0	1					
ro-i- nia_dae																														
cilia																														
Py-Nyn515	5	1.00	0.01	0.00	0.36	0.08	0	1	1	0	0	1	0	0	0	2300	0.53	1	0	1	0	0	0	0	0	0				
ro-i- nia_dichonus																														
Satyrjum349	5	1.00	0.01	0.00	0.30	1.00	0	1	0	1	0	1	0	0	0	2000	0.02	1	0	1	0	0	0	0	0	0				
ciaecaenidae																														
Satyrjum106	5	1.00	0.01	0.00	0.32	0.70	0	0	1	1	1	0	0	100	1200	0.00	1	0	0	0	0	0	0	0	0	0				
culicaenidae																														
Satyrjum586	5	1.00	0.01	0.00	0.34	0.10	0	0	1	0	1	0	0	0	1800	0.00	0	0	1	0	0	0	0	0	0	0				
cis caenidae																														
Satyrjum NaN	5	1.00	0.01	0.00	0.29	0.57	0	0	1	0	1	0	0	600	1900	0.53	1	0	0	0	0	0	0	0	0	0				
ererraenidae																														
Satyrjum408	5	1.00	0.01	0.00	0.31	0.16	0	0	1	0	1	0	0	100	600	0.00	1	0	1	1	0	0	0	0	0	0				
caenidae																														
Satyrjum483	5	1.00	0.01	0.00	0.30	0.16	0	0	1	0	1	1	0	0	2000	0.51	1	0	1	1	0	0	0	0	0	0				
caenidae																														
Satyrjum553	5	1.00	0.01	0.00	0.30	0.06	0	0	1	1	1	0	0	0	1700	0.00	1	0	0	1	0	0	0	0	0	0				
albumenidae																														

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species	fam-	con-	serv-	corner-	GEN_Av-	male_av-	WSP_Fe-										FM_Av-	er-	AFB_An-									
							er- WSP_Fe-	ELT_sin-	er-	er-	er-	er-	er-	er-	er-	er-			ey-	i-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-	AFB_min-	AFB_max-
Thecla caenidae	Ly-6285	5	1.00	0.01	0.00	0.035	0.10	0.10	0	0	1	0	1	0	0	0	1600	0.51	1	0	0	1	0	0	0	0	0	
tu-lae	Thy-Hell-4964	4	1.50	0.02	0.01	0.024	0.10	0.08	0	1	0	0	0	1	0	0	2500	0.53	1	0	0	0	0	0	0	0	0	
cus parionidae	Thy-Hell-NA5	5	2.50	0.03	0.01	0.024	0.10	NA	0	1	0	0	NA	NA	NA	1000	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
cus penistiidae	Thy-Hell-10	5	1.00	0.01	0.00	0.032	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	2000	0.00	1	0	0	0	0	0	0	0		
cus phyraxidae	Thy-Hell-4265	5	1.00	0.01	0.00	0.025	0.07	0	1	0	0	0	1	1	0	2500	0.53	1	0	0	0	0	0	0	1	1		
cus phirine-ida	Thy-Hell-8325	5	1.00	0.01	0.00	0.026	0.10	0.10	0	1	0	0	0	1	0	0	2600	0.53	1	0	0	0	0	0	0	1		
ola	Tom-Ly-51	5	1.00	0.01	0.00	0.029	0.10	0.05	0	1	0	0	1	0	0	2000	1.00	0.02	1	0	0	0	0	0	0	0		
lus caenidae	Tom-Ly-NA5	NA	1.00	0.01	0.00	0.028	0.10	NA	1	1	0	0	1	0	0	0	2300	0.00	NA	NA	NA	NA	NA	NA	NA	NA		
li-caenidae	Tom-Ly-3	0	1.00	0.01	0.00	0.032	0.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	2300	0.51	NA	NA	NA	NA	NA	NA	NA	NA		
machus	Tu-Ly-3	2	1.50	0.02	0.01	0.021	0.05	0.77	NA	NA	NA	NA	NA	NA	NA	NA	1500	0.00	1	0	0	0	0	0	0	1		
gelicaenidae	Van-Ly-13	5	2.00	0.03	0.02	0.059	0.30	0.06	0	1	0	0	1	0	0	0	2500	0.57	1	0	1	1	1	1	1	1		
ica	Van-Ly-13	5	2.00	0.03	0.02	0.054	0.08	0.03	0	1	0	0	1	0	0	0	3000	0.08	1	0	1	1	0	0	0	0		
da																												
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species	range	size	con- serv	GEN_Av- er	GEN_Fe- male_av- er	WSP_Fe- male_av- er	WSP_Fe- range	SL	EL	VE	ET	HA	HH	LL	TY	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1
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```
# contains is another useful command to select columns.
```

```
be %>%
  select(species, contains("LEV")) %>%
  drop_na()
```

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Aglais_io	0	0	1	0	0
Aglais_urticae	0	0	1	0	0
Agriades_aquilo	0	0	1	0	0
Agriades_glandon	0	0	1	0	0
Agriades_optilete	0	1	1	0	0
Agriades_pyrenaicus	0	1	0	0	0
Agriades_zulichi	1	1	1	0	0
Anthocharis_car-	0	0	1	0	0
damines					
Anthocharis_euphe-	0	0	1	0	0
noides					
Apatura_ilia	0	0	0	1	1
Apatura_iris	0	0	0	1	0
Apatura_metis	0	0	0	1	1
Aphantopus_hyper-	0	1	1	0	0
antus					
Aporia_crataegi	0	0	1	1	0
Araschnia_levana	0	0	1	0	0
Archon_apollinus	0	0	1	0	0
Arethusana_arethusa	0	1	1	0	0
Argynnis_pandora	1	1	1	0	0
Argynnis_paphia	0	0	1	0	0
Aricia_agemis	0	1	1	0	0
Aricia_anteros	0	0	1	0	0
Aricia_artaxerxes	0	1	1	0	0
Aricia_cramera	0	1	1	0	0
Aricia_morroneis	0	0	1	0	0
Aricia_nicias	0	0	1	0	0
Azanus_ubaldus	0	0	0	1	0
Boloria_aquilonaris	0	1	1	0	0
Boloria_dia	0	0	1	0	0
Boloria_eunomia	0	0	1	0	0
Boloria_euphrosyne	0	0	1	0	0
Boloria_freija	0	0	0	1	0
Boloria_frigga	0	0	0	1	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Boloria_graeca	0	0	1	0	0
Boloria_improba	0	0	1	0	0
Boloria_napaea	0	1	1	0	0
Boloria_pales	0	0	1	0	0
Boloria_selene	0	0	1	0	0
Boloria_thore	0	0	1	0	0
Boloria_titania	0	0	1	0	0
Borbo_borbonica	0	1	1	0	0
Brenthis_daphne	0	0	0	1	0
Brenthis_hecate	0	0	1	0	0
Brenthis_ino	0	1	1	0	0
Brintesia_circe	0	1	1	0	0
Callophrys_rubi	0	1	1	1	0
Carcharodus_alceae	0	0	1	0	0
Carcharodus_baeticus	0	1	1	0	0
Carcharodus_floccifera	0	0	1	0	0
Carcharodus_lavatherae	0	1	1	0	0
Carterocephalus_palaemon	0	0	1	0	0
Carterocephalus_silvicola	0	0	1	0	0
Catopsilia_florella	0	0	0	1	1
Celastrina_argiolus	0	0	0	1	1
Charaxes_jasius	0	0	0	0	1
Chazara_briseis	0	1	1	0	0
Coenonympha_arcania	0	0	1	0	0
Coenonympha_dorus	0	0	1	0	0
Coenonympha_glycerion	0	0	1	0	0
Coenonympha_hero	0	0	1	0	0
Coenonympha_leander	0	0	1	0	0
Coenonympha_oedippus	0	0	1	0	0
Coenonympha_pamphilus	0	0	1	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Coenonympha_rhodopen- sis	0	0	1	0	0
Coenonympha_thyr- sis	0	0	1	0	0
Coenonympha_tullia	0	0	1	0	0
Colias_alfacariensis	0	1	1	0	0
Colias_aurorina	0	0	1	0	0
Colias_caucasica	0	0	1	0	0
Colias_chrysotheme	0	1	1	0	0
Colias_crocea	0	0	1	0	0
Colias_hecla	0	1	0	0	0
Colias_hyale	0	1	1	0	0
Colias_myrmidone	0	0	1	0	0
Colias_palaeno	0	1	1	0	0
Colias_phicomone	0	1	0	0	0
Colias_tyche	0	1	0	0	0
Colotis_evagore	0	0	1	0	0
Cupido_alcetas	0	0	1	0	0
Cupido_argiades	0	0	1	0	0
Cupido_decoloratus	0	0	1	0	0
Cupido_lorquini	0	0	1	0	0
Cupido_minimus	0	0	1	0	0
Cupido_osiris	0	0	1	0	0
Cyaniris_semiargus	0	0	1	0	0
Cyclotrius_webbianus	0	0	1	0	0
Danaus_chrysippus	0	0	1	0	0
Danaus_plexippus	0	0	1	0	0
Erebia_aethiops	0	1	1	0	0
Erebia_cassioides	0	1	1	0	0
Erebia_claudina	0	0	1	0	0
Erebia_embla	0	0	1	0	0
Erebia_epiphron	0	0	1	0	0
Erebia_eriphyle	0	0	1	0	0
Erebia_euryale	0	0	1	0	0
Erebia_gorge	0	0	1	0	0
Erebia_ligea	0	1	1	0	0
Erebia_manto	0	0	1	0	0
Erebia_medusa	0	1	1	0	0
Erebia_meolans	0	1	1	0	0
Erebia_mnestra	0	0	1	0	0
Erebia_montana	0	1	0	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Erebia_neoridas	0	0	1	0	0
Erebia_oeme	0	1	1	0	0
Erebia_palarica	0	1	1	0	0
Erebia_pandrose	0	1	1	0	0
Erebia_pluto	0	1	1	0	0
Erebia_polaris	0	0	1	0	0
Erebia_triarius	0	1	1	0	0
Erynnis_tages	0	0	1	0	0
Euchloe_ausonia	0	0	1	0	0
Euchloe_bazae	0	1	0	0	0
Euchloe_belemia	0	1	0	0	0
Euchloe_charlonia	0	1	1	0	0
Euchloe_crameri	0	0	1	0	0
Euchloe_insularis	0	0	1	0	0
Euchloe_penia	0	1	1	0	0
Euchloe_simplonia	0	1	1	0	0
Euchloe_tagis	0	1	1	1	0
Eumedonia_eumedon	0	1	1	0	0
Euphydryas_aurinia	0	1	1	0	0
Euphydryas_cynthia	0	1	1	0	0
Euphydryas_desfontainii	0	0	1	0	0
Euphydryas_iduna	0	0	1	0	0
Euphydryas_intermedia	0	1	0	1	0
Euphydryas_materna	0	0	1	1	1
Fabriciana_adippe	0	0	1	0	0
Fabriciana_elisa	0	0	1	0	0
Fabriciana_niobe	0	1	1	0	0
Favonius_quercus	0	0	0	0	1
Gegenes_nostrodamus	0	0	1	0	0
Gegenes_pumilio	0	0	1	0	0
Glaucopsyche_alexis	0	0	1	0	0
Glaucopsyche_melanops	0	0	1	0	0
Glaucopsyche_paphos	0	0	1	0	0
Gonepteryx_cleobule	0	0	0	1	1

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Gonepteryx_cleopatra	0	0	0	1	0
Gonepteryx_farinosa	0	0	0	1	0
Gonepteryx_rhamni	0	0	0	1	0
Hamearis_lucina	0	1	1	0	0
Hesperia_comma	0	1	1	0	0
Heteropterus_morphheus	0	0	1	0	0
Hipparchia_azorina	0	0	1	0	0
Hipparchia_cypriensis	0	1	1	0	0
Hipparchia_fagi	0	1	1	0	0
Hipparchia_fatua	0	1	1	0	0
Hipparchia_fidia	0	0	1	0	0
Hipparchia_hermione	0	1	1	0	0
Hipparchia_maderensis	0	0	1	0	0
Hipparchia_pellucida	0	1	1	0	0
Hipparchia_semele	0	1	1	0	0
Hipparchia_statilinus	0	1	1	0	0
Hipparchia_syriaca	0	1	1	0	0
Hipparchia_volgensis	0	1	1	0	0
Hipparchia_wyssii	0	1	1	0	0
Hyponephele_lupina	0	1	1	0	0
Hyponephele_lycaon	0	0	1	0	0
Iolana_iolas	0	1	1	0	0
Iphiclides	0	0	0	1	0
Iphiclides_feisthamelii					
Iphiclides_podalirius	0	1	1	0	0
Issoria_lathonia	0	1	1	0	0
Kirinia_climene	0	1	1	0	0
Kretania_eurypilus	0	0	1	0	0
Kretania_hesperica	0	0	1	0	0
Kretania_psyllorita	0	0	1	0	0
Kretania_pylaon	0	0	1	0	0
Kretania_trappi	0	1	1	0	0
Laeosopis_roboris	0	1	0	0	1
Lampides_boeticus	0	0	1	0	0
Lasiommata_maera	0	0	1	0	0
Lasiommata_megera	0	0	1	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Lasiom-	0	0	1	0	0
mata_paramegaera					
Lasiom-	0	0	1	0	0
mata_petropolitana					
Leptidea_duponcheli	0	1	1	0	0
Leptidea_juvernica	0	0	1	0	0
Leptidea_morsei	0	0	1	0	0
Leptidea_reali	0	0	1	0	0
Leptidea_sinapis	0	0	1	0	0
Leptotes_pirithous	0	0	1	0	0
Libythea_celtis	0	0	0	0	1
Limenitis_camilla	0	0	0	1	1
Limenitis_populi	0	0	0	0	1
Limenitis_reducta	0	0	0	1	0
Lopinga_achine	0	1	1	0	0
Lycaena_alciphron	0	1	1	0	0
Lycaena_candens	0	1	0	0	0
Lycaena_dispar	0	1	1	0	0
Lycaena_helle	0	0	1	0	0
Lycaena_hippothoe	0	1	1	0	0
Lycaena_phlaeas	0	1	0	0	0
Lycaena_tityrus	0	1	1	0	0
Lycaena_virgaureae	0	1	0	0	0
Lysandra_albicans	0	0	1	0	0
Lysandra_bellargus	0	1	0	0	0
Lysandra_coridon	0	1	0	0	0
Lysandra_corydonius	0	1	1	0	0
Lysandra_hispana	0	0	1	0	0
Maniola_chia	0	1	1	0	0
Maniola_cypricola	0	1	1	0	0
Maniola_halicarnas-	0	1	1	0	0
sus					
Maniola_jurtina	0	1	1	0	0
Maniola_megala	0	1	1	0	0
Maniola_nurag	0	1	1	0	0
Maniola_telmessia	0	1	1	0	0
Melanargia_galathea	0	1	1	0	0
Melanargia_ines	0	0	1	0	0
Melanargia_lachesis	0	1	1	0	0
Melanargia_larissa	0	1	1	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Melanargia_occitanica	0	1	1	0	0
Melanargia_russiae	0	1	1	0	0
Melitaea_arduinna	0	1	0	0	0
Melitaea_asteria	0	1	1	0	0
Melitaea_athalia	0	1	1	0	0
Melitaea_aurelia	0	0	1	0	0
Melitaea_britomartis	0	0	1	0	0
Melitaea_cinxia	0	1	1	0	0
Melitaea_deione	0	1	1	0	0
Melitaea_diamina	0	1	1	0	0
Melitaea_didyma	0	0	1	0	0
Melitaea_ornata	0	0	1	0	0
Melitaea_parthenoides	0	0	1	0	0
Melitaea_phoebe	0	0	1	0	0
Melitaea_trivia	0	0	1	0	0
Melitaea_varia	0	1	1	0	0
Minois_dryas	0	1	1	0	0
Muschampia_proto	0	1	1	0	0
Nymphalis_antiope	0	0	0	1	1
Nymphalis_poly-chloros	0	0	0	1	1
Nymphalis_vaulsleyana	0	0	0	0	1
Nymphalis_xanthomelas	0	0	0	0	1
Ochlodes_sylvanus	0	0	1	0	0
Oeneis_bore	0	0	1	0	0
Oeneis_jutta	0	0	1	0	0
Oeneis_norna	0	0	1	0	0
Papilio_alexanor	0	0	1	0	0
Papilio_hospiton	0	1	1	0	0
Papilio_machaon	0	0	1	0	0
Pararge_aegeria	0	0	1	0	0
Pararge_xiphia	0	1	1	0	0
Pararge_xiphioides	0	1	1	0	0
Parnassius_apollo	0	1	0	0	0
Parnassius_mnemosyne	0	1	0	0	0
Parnassius_phoebus	0	1	1	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Pelopidas_thrax	0	0	1	0	0
Phengaris_alcon	1	1	1	0	0
Phengaris_arion	1	1	1	0	0
Phengaris_nausithous	1	1	1	0	0
Phengaris_teleius	1	1	1	0	0
Pieris_brassicae	0	1	1	0	0
Pieris_bryoniae	0	1	0	0	0
Pieris_cheiranthi	0	1	1	1	0
Pieris_ergane	0	1	1	0	0
Pieris_krueperi	0	0	1	0	0
Pieris_mannii	0	1	1	0	0
Pieris_napi	0	1	1	0	0
Pieris_rapae	0	1	1	0	0
Plebejus_argus	0	1	1	0	0
Plebejus_argyrogonomon	0	0	1	0	0
Plebejus_idas	0	0	1	0	0
Polygonia_c-album	0	0	1	1	1
Polygonia_egea	0	0	1	0	0
Polyommatus_admetus	1	1	1	0	0
Polyommatus_aman-dus	0	1	1	0	0
Polyommatus_aroaniensis	0	0	1	0	0
Polyommatus_damon	0	1	0	0	0
Polyommatus_daph-nis	0	1	1	0	0
Polyommatus_dory-las	0	1	1	0	0
Polyommatus_eros	0	0	1	0	0
Polyommatus_escheri	0	1	1	0	0
Polyommatus_fabres-sei	0	0	1	0	0
Polyommatus_ful-gens	0	0	1	0	0
Polyommatus_golgus	1	1	1	0	0
Polyommatus_icarus	0	1	1	0	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Polyommatus_nivescens	0	1	1	0	0
Polyommatus_ripar-tii	0	1	1	0	0
Polyommatus_ther-sites	0	1	1	0	0
Polyommatus_viole-tae	0	0	1	0	0
Pontia_callidice	0	1	0	0	0
Pontia_chloridice	0	0	1	0	0
Pontia_daplidice	0	0	1	0	0
Pontia_edusa	0	1	0	0	0
Proterebia_phegea	0	1	1	0	0
Pseudochazara_an-thelea	1	1	1	0	0
Pseu-dophilotes_abencer-ragus	0	0	1	0	0
Pseu-dophilotes_barbagiae	0	0	1	0	0
Pseudophilotes_ba-ton	0	0	1	0	0
Pseudophilotes_bav-ius	0	0	1	0	0
Pseudophilotes_vi-crama	0	0	1	0	0
Pyrgus_alveus	0	0	1	0	0
Pyrgus_armoricanus	0	0	1	1	0
Pyrgus_carthami	0	1	1	0	0
Pyrgus_cirsii	0	1	1	0	0
Pyrgus_malvae	0	0	1	0	0
Pyrgus_malvoides	0	1	1	0	0
Pyrgus_onopordi	0	1	1	0	0
Pyrgus_serratulae	0	1	1	0	0
Pyronia_bathseba	0	1	1	0	0
Pyronia_cecilia	0	0	1	0	0
Pyronia_tithonus	0	1	1	0	0
Satyrium_acaciae	0	1	0	1	0
Satyrium_esculi	0	0	0	1	1
Satyrium_ilicis	0	0	0	1	0
Satyrium_ledereri	0	0	0	1	0

species	LEV_buried_layer	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Satyrium_pruni	0	0	0	1	0
Satyrium_spini	0	0	0	1	0
Satyrium_w-album	0	0	0	1	1
Satyrus_actaea	0	1	1	0	0
Satyrus_ferula	0	1	1	0	0
Scolitantides_orion	0	0	1	0	0
Speyeria_aglaja	0	1	1	0	0
Spialia_sertorius	0	1	1	0	0
Spialia_therapne	0	1	1	0	0
Tarucus_balkanicus	0	0	1	0	0
Tarucus_theophrastus	0	0	0	1	0
Thecla_betulae	0	0	0	1	0
Thymelicus_acteon	0	0	1	0	0
Thymelicus_christi	0	0	1	0	0
Thymelicus_lineola	0	0	1	0	0
Thymelicus_sylvestris	0	0	1	0	0
Tomares_ballus	0	0	1	0	0
Tomares_callimachus	1	1	1	0	0
Vanessa_atalanta	0	0	1	0	0
Vanessa_cardui	0	0	1	0	0
Vanessa_virginiensis	0	0	1	0	0
Vanessa_vulcania	0	0	1	0	0
Ypthima_asterope	0	0	1	0	0
Zegris_eupheme	0	0	1	0	0
Zerynthia_cassandra	0	0	1	0	0
Zerynthia_cerisy	0	0	1	0	0
Zerynthia_cretica	0	0	1	0	0
Zerynthia_polyxena	0	0	1	0	0
Zerynthia_rumina	0	1	1	0	0

Functions like `contains` can be powerful for filtering and selecting. `starts_with` and `ends_with` work just the same way and are equally useful.

4.7 Create new variables with `mutate()`

This is a very powerful and flexible function that uses existing variables to create novel ones. Let's look at a simple example

```
# Create a new variable summarizing all the overwintering stages that are not adults
be %>%
  mutate(OWS_juvenile = 1-OWS_adult) %>%
  select(OWS_juvenile, OWS_adult) %>%
  drop_na()
```

[illegible]

[illegible]

[illegible]

OWS_juvenile	OWS_adult
1	0
1	0
1	0
1	0
1	0
1	0
1	0
0	1
0	1

```
# Determine how different the protection levels between EU and Europe and extract the species
be %>%
  mutate(protect_diff = abs(conserv.europe - conserv.eu)) %>%
  filter(protect_diff > 2)
```

			WSP_Fe-										FM_Av-		AFB_Av-		AFB_an-											
	con-	GEN_Av-	male_av-	er-WSP_Fe-										er-		ey-		i- AFB-										
speci-	range	size	OVS	OVS	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN	GEN											
Corymbus	52	10	1.00	1.00	0.38	0.25	0.80	1	0	0	1	0	0	0	50	3.00	1	0	1	1	0	0	0	3				
pusi-																												
dae																												
LyLy14	2	5	0	0	1	0	1.25	1.50	0.52	4.6	0.28	0.90	1	0	0	1	0	0	10	17	0.00	1	0	1	0	0	0	3
caenidae																												
Tomia	2	3	10	NAN	NAN	NAN	1.00	1.00	0.32	2.5	1.00	NAN	NAN	NAN	NAN	NAN	0	23	0.51	NAN	NAN	NAN	NAN	NAN	NAN	3		
geliaenidae																												

4.8 Exercise

- From our dataset, filter out all butterflies with average wingspans larger than 60mm and smaller than 30mm. Only keep the species that have a conservation classification on the EU level. Only keep the species names and all variables associated with adult feeding, and store this in a new data frame. How many rows and columns does the new data frame have?
- Re-calculate the generation range from the provided minima and maxima. Check if your calculations match the original range values given in the data.

4.9 group_by() and summarise() as powerful data exploration tools

Although `dplyr` has a simpler syntax overall, everything we have looked at so far could have been done fairly easily with base R functions: data frame filtering, sorting, and adding and removing columns. One of the strengths of `dplyr` is explorative data analysis, and this is where `group_by()` and `summarise()` are really helpful. We'll only look at very simple examples today.

When browsing through the complete data table, it is very hard to recognize any patterns. Let's assume we wanted to compare the average wing span of butterflies with that overwinter as adults vs all other butterflies:

```
# Are butterflies that overwinter as adults larger than other species?
be %>%
  drop_na() %>%
  group_by(OWS_adult) %>%
  summarise(mean_wsp = mean(WSP_Female_average))
```

OWS_adult	mean_wsp
0	39.42489
1	51.85294

After choosing which variable to group by (here: `OWS_adult`), `summarise()` then calculates a function for each group. In our simple example, there are 2 groups: 0 (not overwintering as adult) and 1 (overwintering as adult); and the function to be calculated is the mean of the female wing span. This is a very flexible set of functions, because you can group by multiple groups and also use `summarise()` with many different functions (e.g., `mean()`, `sum()`, `min()`, `max()`, `median()` – just to name a few). Let's look at a more complex example:

```
# Let's add another group. How large is the standard deviation? How large is each group?
be %>%
  drop_na() %>%
  group_by(OWS_adult, LEV_ground_layer) %>%
  summarise(mean_wsp = mean(WSP_Female_average),
            sd = sd(WSP_Female_average),
            group_size=n())
```

``summarise()`` has grouped output by `'OWS_adult'`. You can override using the ``.groups`` argument.

OWS_adult	LEV_ground_layer	mean_wsp	sd	group_size
0	0	38.12174	12.312380	115
0	1	40.69492	12.181504	118
1	0	54.26667	9.460192	15
1	1	33.75000	12.374369	2

4.10 More exercises

Using `dplyr` functions, determine

- If butterflies overwintering as pupae have higher level of legal protection
- If butterflies occurring at higher altitudes on average have a higher level of protection
- If feeding on honeydew is more common in larger butterflies.
- How many butterfly species are there per family?

For a–c also determine how many species belong to each group.

5 The ggplot2 package

5.1 Very (!) brief introduction

ggplot2 is a graphing library, i.e., a tool to make graphs in R. Compared with base graphs and other graphics packages, it comes with a number of advantages:

- Beautiful!
- Highly customizable (which is not always necessary though)
- Easiest way to create very complex plots
- Tightly integrated into the **tidyverse**

Compared with other packages the major drawbacks would be that it comes with a steep(ish) learning curve and is probably less intuitive for beginners. The reason is that **ggplot2** doesn't have fixed commands for scatterplots, boxplots, barplots, etc, but rather creates the plot in layers. The most important elements (or layers) of a plot in **ggplot2** are:

- *Data*: as we are still in the **tidyverse**, this is always a data frame
- *Aesthetics*: i.e., **what** you want to plot. Often, this will correspond to variables (columns) in your dataframe
- *Geometric objects*: i.e., **how** you want to plot the data. This can be points, bars, boxplots, lines, etc..
- *Facets*: more about this later
- *Additional (optional) adjustments*: this includes themes that specify the overall design

5.2 Building up the plot

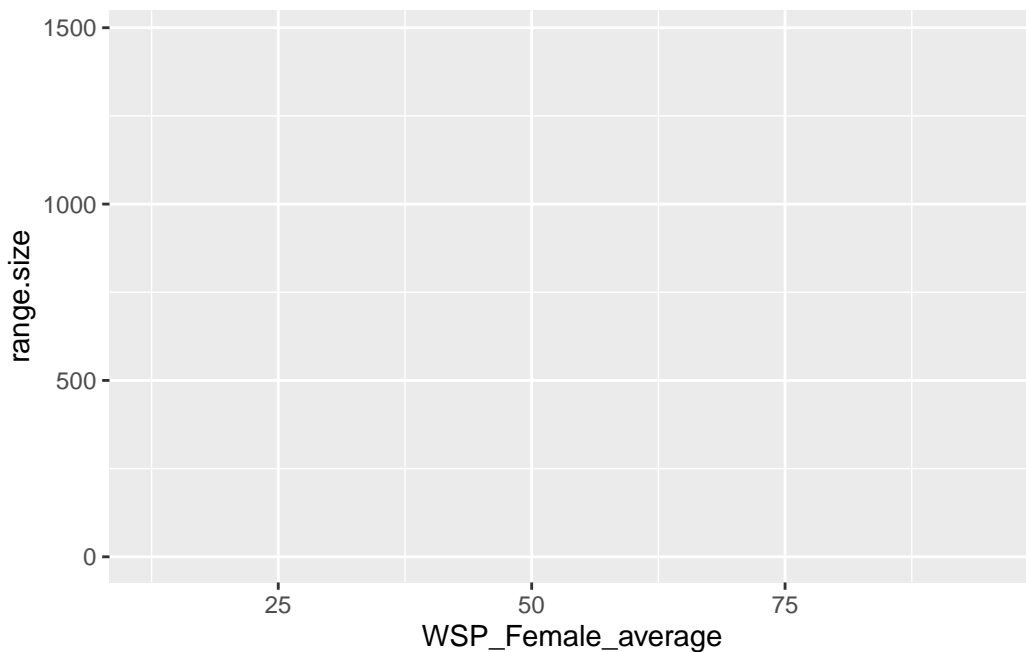
We will start off with a very simple scatterplot and gradually increase the complexity to illustrate **ggplot2** functionality.

```
# data and packages
library(tidyverse, quietly = TRUE)
```

```
-- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
v dplyr      1.1.4      v readr      2.1.6
v forcats    1.0.1      v stringr   1.6.0
v ggplot2    4.0.1      v tibble    3.3.1
v lubridate  1.9.4      v tidyr     1.3.2
v purrr      1.2.1
-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()     masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become
```

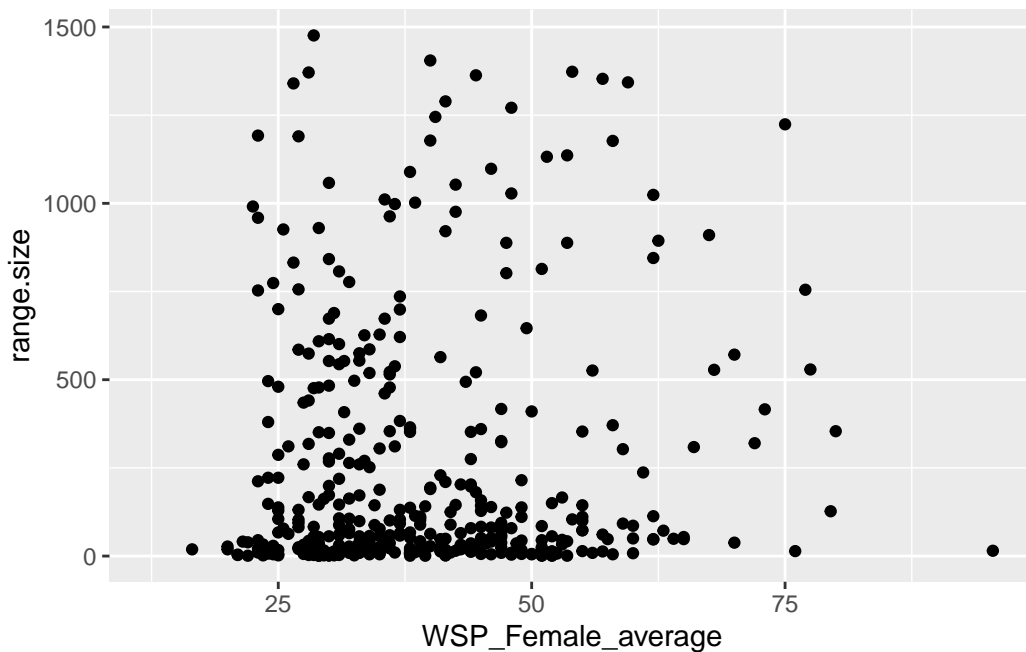
```
be <- read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# simple plot
be %>%                                # DATA
  ggplot(aes(x = WSP_Female_average, # AESTHETICS
             y = range.size))
```



In the above example, the data is the data frame that we have been using the whole time. Notice how we can simply pipe it to `ggplot2`. `aes` specifies our aesthetics, i.e., **what** we want to plot. What is missing?

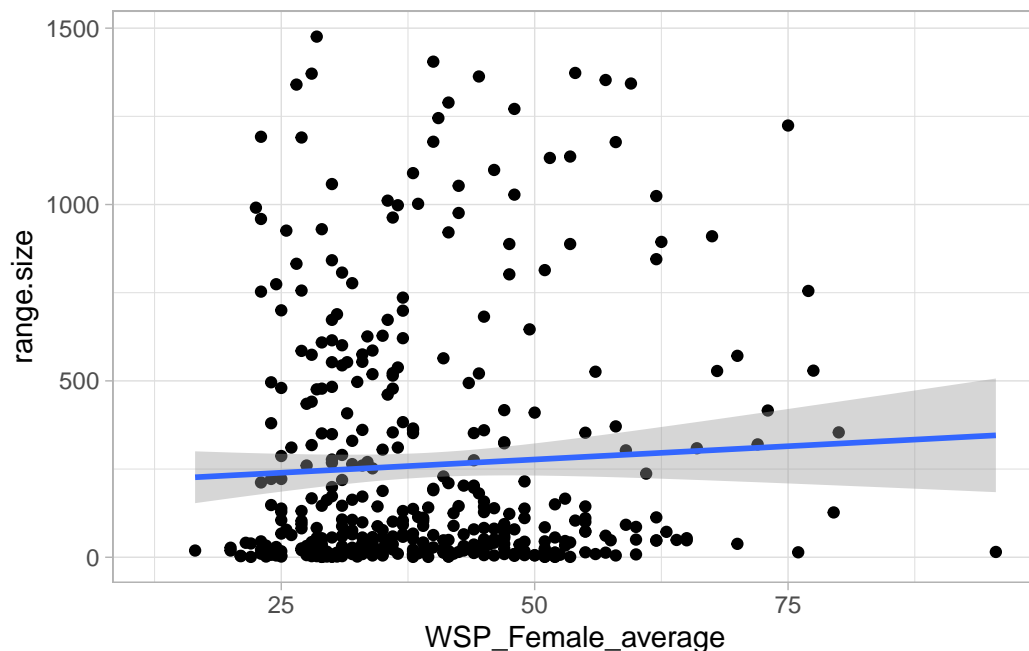

```
# simple scatter plot
be %>%                                # DATA
  ggplot(aes(x = WSP_Female_average, # Aesthetics
             y = range.size)) +
  geom_point()                         # Geometric object
```



The geometric object, i.e., **how** we want to plot our aesthetics. Notice that elements in `ggplot2` are added with the `+` symbol (this is specific to `ggplot2`). We can add more geometric objects that will use the same aesthetics:

```
# lets add another geom (a regression line), and also change the theme
be %>%                                # DATA
  ggplot(aes(x = WSP_Female_average, # Aesthetics
             y = range.size)) +
  geom_point() +                      # Geometric object
  geom_smooth(method = "lm") +        # Another geometric object
  theme_light()                      # Let's also change the theme
```

``geom_smooth()`` using formula = `'y ~ x'`



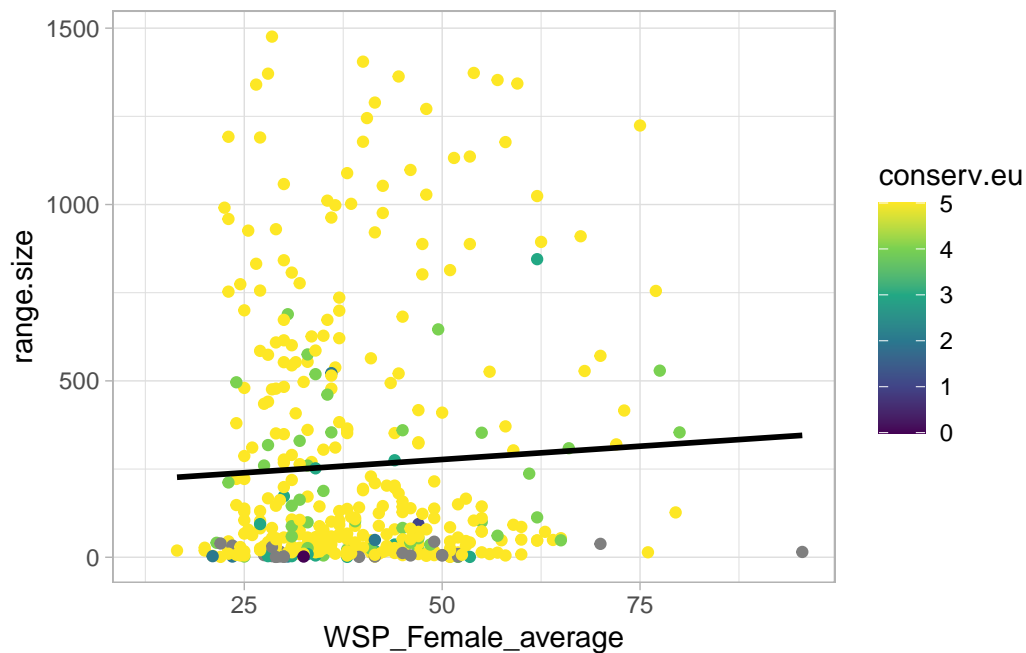
Changing the theme changes many layout options. For different applications, different themes might be appropriate. There are many additional themes available through packages such as [ggthemr](#) or [ggthemes](#).

A bit more on aesthetics: have you noticed that you only specify x and y once, and all geoms know **what** you want to plot. You can also specify additional aesthetics for each geom.

```
# Add additional aesthetics, here: we want to plot the conservation status. How? With colour

be %>%                                # DATA
  ggplot(aes(x = WSP_Female_average,   # Aesthetics
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) + # aesthetics specific to the points only
  geom_smooth(method = "lm",
              color = "black",
              se = FALSE) +
  theme_light() +
  scale_color_viridis_c()              # let's use some nicer colors
```

```
`geom_smooth()` using formula = 'y ~ x'
```



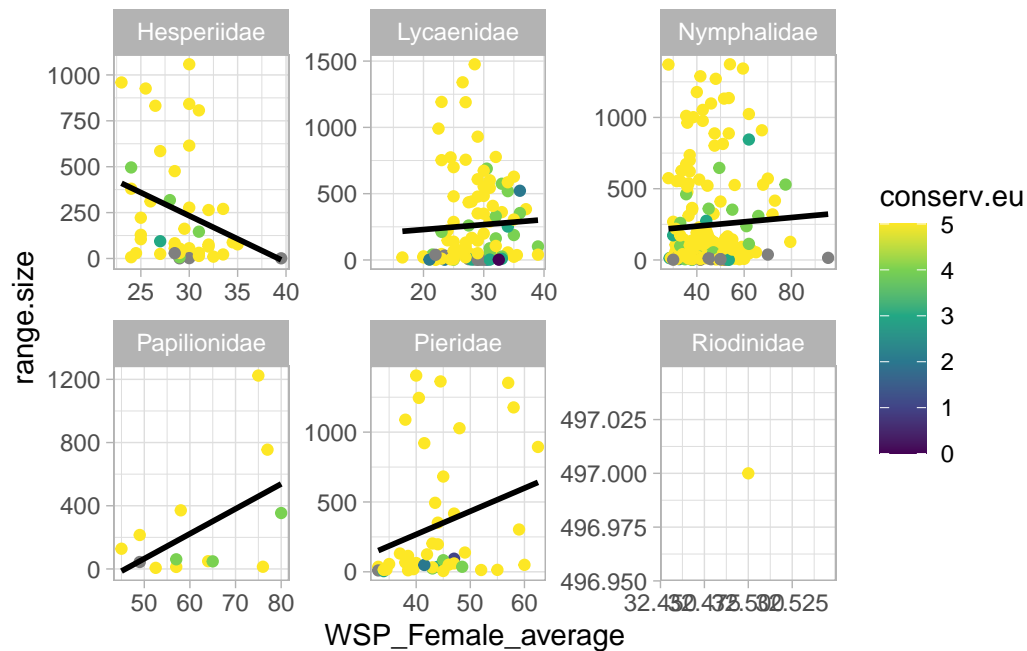
Aesthetics can be added through colors or shapes

5.3 Faceting

So far, we have cramped as much information as possible into the plot. This was useful to illustrate the functionality of `ggplot2`, but did not create very readable plots. Often, faceting is a better solution. The implementation in `ggplot2` is very straightforward.

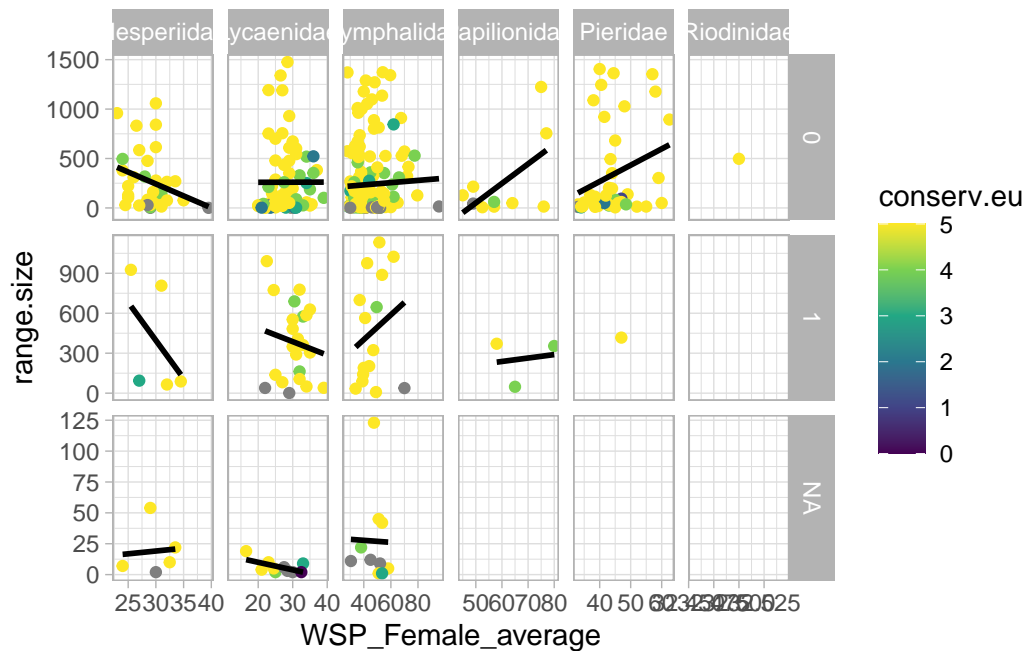
```
# Same example as before, faceted over family
be %>%
  ggplot(aes(x = WSP_Female_average,
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +
  geom_smooth(method = "lm",
             color = "black",
             se = FALSE) +
  theme_light() +
  scale_color_viridis_c() +
  facet_wrap(~family, scales = "free")
```

``geom_smooth()`` using formula = 'y ~ x'



```
# And now, faceting over 2 variables
be %>%
  ggplot(aes(x = WSP_Female_average,
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +
  geom_smooth(method = "lm",
             color = "black",
             se = FALSE) +
  theme_light() +
  scale_color_viridis_c() +
  facet_grid(OWS_egg ~ family, scales = "free") # faceting
```

`geom_smooth()` using formula = 'y ~ x'

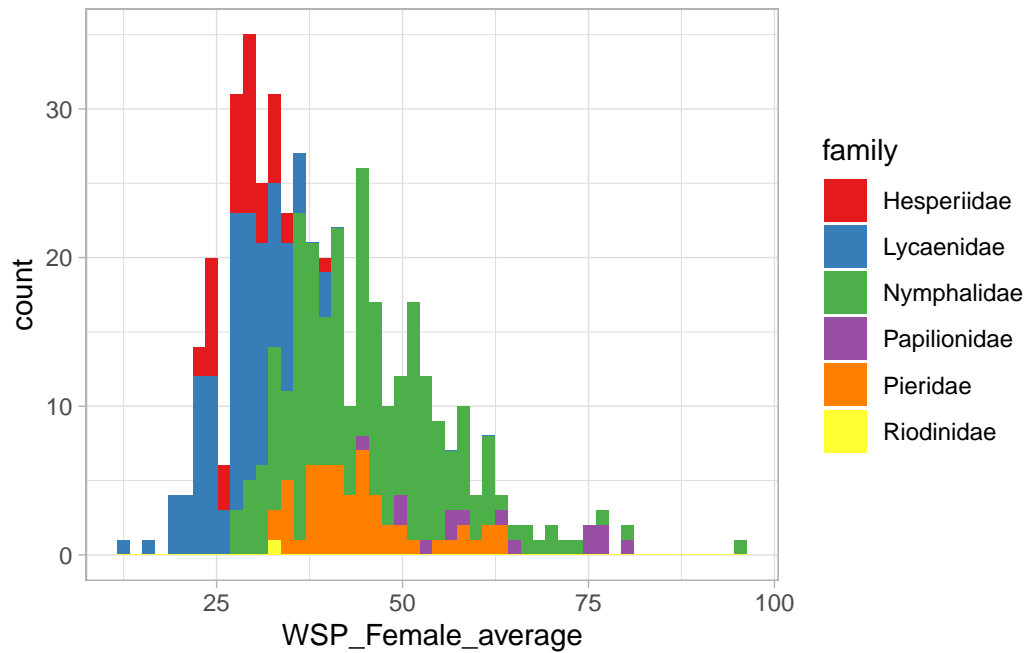


The above plot would need a little ‘cleaning up’. How would you do that?

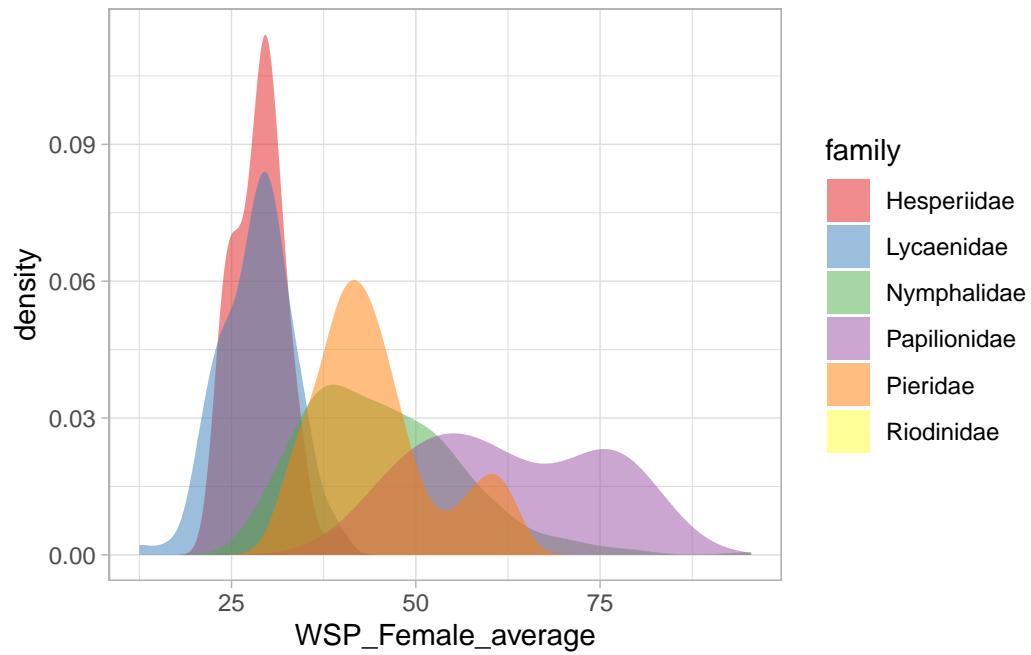
5.4 Some common plot types

We have looked at scatterplots, now let’s look at a number of other commonly used plots.

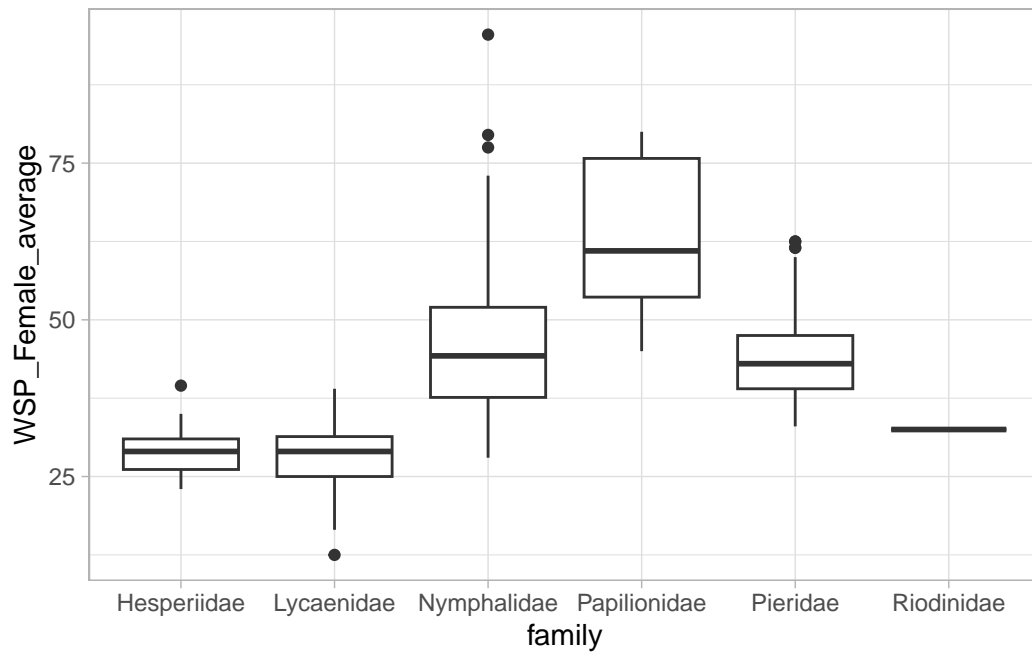
```
# histograms
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_histogram(bins = 50) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```



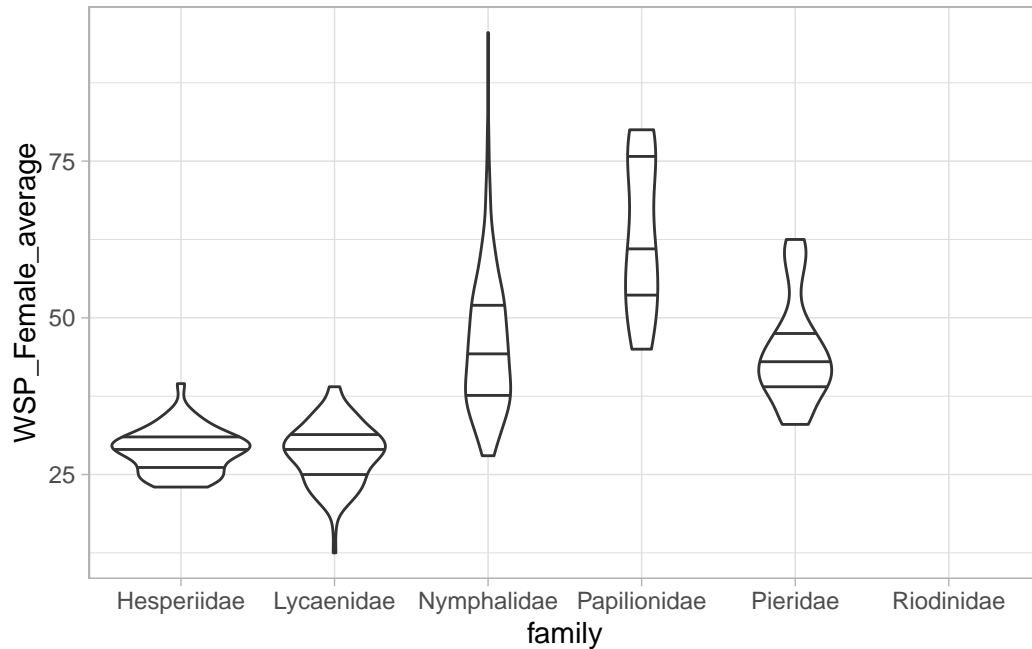
```
# better alternative are often density plots
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_density(alpha = 0.5, colour = NA) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```



```
# boxplots
be %>%
  ggplot(aes(y = WSP_Female_average, x = family)) +
  geom_boxplot() +
  theme_light()
```



```
# better alternative are violin plots
be %>%
  ggplot(aes(y = WSP_Female_average, x = family)) +
  geom_violin(draw_quantiles = c(0.25, 0.5, 0.75)) +
  theme_light()
```

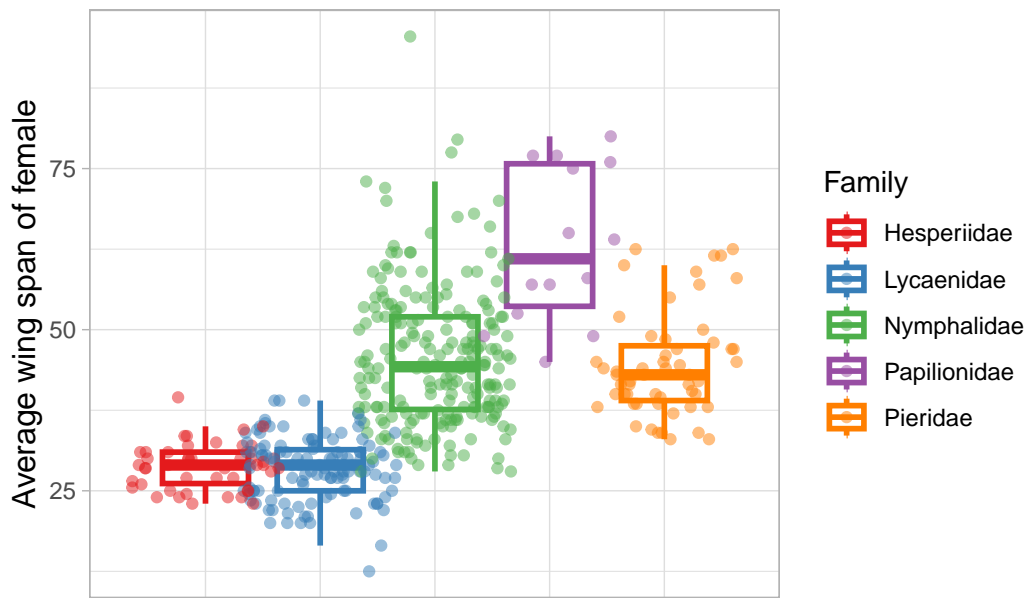



5.5 Fine tuning plots

We now know how to plot some common chart types but most of these don't look publishable yet. Lets return to one of our first examples and see how to polish it a little.

```
# A publication ready plot
be %>%
  filter(family != "Riodinidae") %>%
  ggplot(aes(y = WSP_Female_average, x = family, color = family)) +
  geom_boxplot(lwd = 1, outlier.shape = NA) +
  geom_point(position = position_jitterdodge(jitter.width = 2), alpha = 0.5) +
  theme_light() +
  labs(title = "Wing span across European butterfly families",
       y = "Average wing span of female")+
  theme(plot.title = element_text(face = "bold"),
        axis.title.y = element_text(size = 12),
        axis.title.x = element_blank(),
        axis.text.x = element_blank(),
        strip.text = element_text(size = 11)) +
  scale_color_brewer(palette = "Set1", name = "Family")
```

Wing span across European butterfly families



5.6 Exercise

Using `ggplot2`, explore how range size differs between butterfly families and plot check if butterflies with smaller ranges have higher protection status. Try to find appropriate plot types for this, use the help pages to find plot types that were not introduced to you yet. Explore other variables that may explain some trends in the data. Find a theme that you like! Remember, start with the **data**, add **aesthetics** (**what do you want to plot**), and then think about **geometric objects** (**how do you want to plot the data**). How can colour help in your visualisations? Does faceting make sense?

Part II

UNIX

Part III

Phylogenetics

Part IV

Microbiome

References