Methods in evolutionary ecology WS25/26

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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.

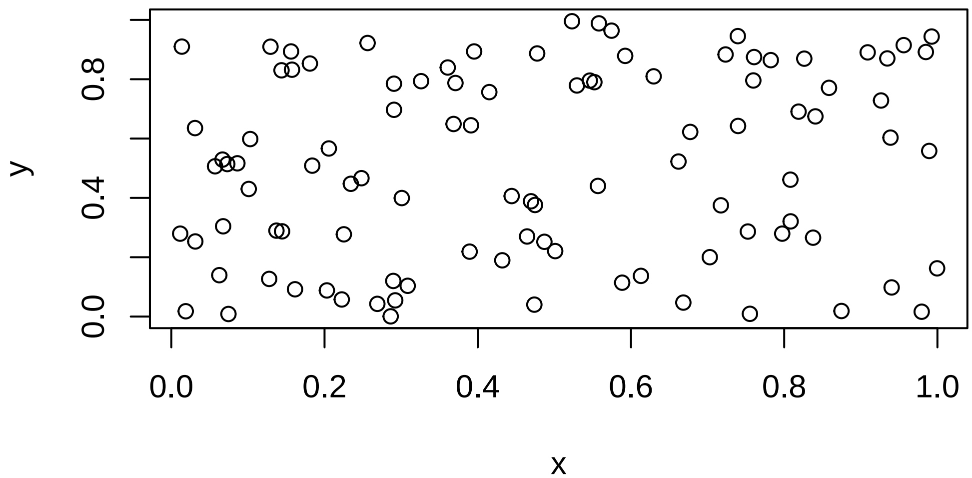
Quarto

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).

```r
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 throughtout 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
```

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

```
[1] 81
```

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

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

```
[1] 9
```

```r
2^3 * 3
```

```
[1] 24
```

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

```
[1] 512
```

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

```r
sqrt(9)
```

```
[1] 3
```

```r
exp(3)
```

```
[1] 20.08554
```

```r
log(3)
```

```
[1] 1.098612
```

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

```
[1] 3
```

```r
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` + `-`).

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

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

```r
x
```

```
[1] 7
```

```r
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.

```r
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 you 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
```

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

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

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

```
[1] FALSE
```

You can convert between types easily!

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

```
[1] 5
```

```r
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"
```

```r
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.

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

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

```r
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.

```r
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

```r
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

```r
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.

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

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

```r
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.

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

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

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

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

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

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

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

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

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

```r
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.

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

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

```r
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.

```r
x >= 5
```

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

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

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

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

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

```r
z
```

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

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

```
[1] 3
```

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

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

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

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

```r
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…

```r
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

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

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

```r
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

a) Create a vector consecutively numbering all days of the year 2026. Assign the correct weekday names for all elements of the vector.
b) 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

```r
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

```r
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"
```

```r
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

```r
mat3
```

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

```r
colnames(mat3)
```

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

```r
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 `,`).

```r
mat3
```

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

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

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

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

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

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

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

2.2.1 Exercise

a) create a matrix using with 20 rows & 5 columns, using 100 randomly generated numbers between 0 and 1000.
b) 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

```r
# 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"
```

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

```
  [1] 10.044094 32.757767  8.925053 13.807362 23.551105 19.234134 29.784401
  [8] 19.914805  8.917980 35.235702 24.112720 30.786224 23.873515 13.694458
 [15] 26.677193 24.903134  6.582594 35.465086 15.766389 36.379711 28.268448
 [22] 31.397243 18.517488 28.823234 28.858379  8.060898 34.694842 21.227169
```

```
 [29] 20.789003  5.464636 18.221045 23.572341 16.128950 39.221586 34.064109
 [36] 22.823254 16.107606 31.412299 14.301667 13.495726 35.563361 20.350248
 [43]  6.479554 34.554516  6.153258 38.462263 25.040311 33.003961 39.740898
 [50] 14.037295 25.109435 31.948507 21.998141 13.225884 32.093805 29.552895
 [57] 21.772292 12.623135 37.886395 26.589330 22.457700  5.915094 11.906434
 [64]  6.783141 14.684739 38.473724  7.001651  5.881051 32.913674 10.432873
 [71] 30.676020 28.439690  5.183506 31.533047 14.069628 36.106217 13.369217
 [78] 15.573841 20.503041 27.824678 35.685208 30.168768 10.182187 23.196161
 [85] 39.480306 19.605731  9.248206 26.402371  5.412345 18.879057 37.590255
 [92] 20.982300 33.570737 39.147252 18.013256 29.459367 16.397009 24.289191
 [99] 26.379787 27.030762 23.856859 16.227416 38.557839 20.207973 18.276160
[106] 16.346004 14.641058 12.194734 33.289332 22.184364 12.231942 19.598883
[113] 28.886417  5.301439 32.198566 25.840199 31.700178 38.854138 17.195720
[120] 13.535357 30.451491 30.208220 10.320936 14.031847 32.070404  7.557059
[127]  9.693760 33.213005 18.586024 33.356090 27.621806 19.878239  6.328824
[134] 17.467950 28.705810 38.572616 21.921200  5.882015 17.224443 11.144815
[141] 30.721523 31.089054 10.981030  7.999222 23.121387 21.696210 25.456123
[148] 31.890229 32.570559 15.022879 13.601822 16.012817 26.485338 33.294767
[155]  8.768550 33.398899 21.827025 33.347179 32.690425 21.520964  7.534485
[162]  9.019292 28.141417 25.774356 24.811242 27.714324 14.011637 36.114202
[169] 34.667347 36.334699  9.025190 35.700573 38.051683  6.168635 26.200303
[176] 25.830076 35.270737 13.999843  8.021445 12.125467 28.337453 29.331106
[183] 33.047502 11.701738 32.420077 26.045249 29.456374 19.806934 26.052081
[190] 31.710512  7.031836 17.751345 28.109164 13.525772  7.660293 14.977394
[197] 12.344184 35.594130 10.804181  6.559926
```

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

```
  [1]  74  67 117 118 102  72  27  35  85 103 107  23 113  86  75  29 115  25
 [19]  63 110  40  99  99  72  73  34  88 103  67 111  40  65  78  71 112 117
 [37]  59  99 108  33 100 100  74  66  45  89  70  68  22 104  38  66  79  44
 [55]  85 116  92  39  76  69 117  47  82  74  89  39  24  28  35  80  80  58
 [73]  44 103  72  24 113  45  65  28  26  23  81  38  92  56  58  48  61 104
 [91]  54  93  41 103 114 106  80  52 111 109  36  37  93 112  35  29  62  21
[109]  51  95  24  54 109  28  64  87  72  62  31  66  76  31  92  35 113  56
[127]  75 114  55  54  55  60  89  42  97  27 105  26  95  59  75  51  92 118
[145]  94 107  72  44  88 103  60  87  56  65  44  67  62  68 109  50  51  52
[163]  24 105  84  43  34  77  72  43 105  74  57  54 108  92  81 109  89  51
[181]  45  67  30  38  91  86 102  24  72 113  95 107  39  29  87  69  55 106
[199]  40  47
```

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

species	dbh	age
beech	10.044094	74
ash	32.757767	67
elm	8.925053	117
maple	13.807362	118
sycamore	23.551105	102
beech	19.234133	72
ash	29.784401	27
elm	19.914805	35
maple	8.917980	85
sycamore	35.235702	103
beech	24.112720	107
ash	30.786224	23
elm	23.873515	113
maple	13.694458	86
sycamore	26.677193	75
beech	24.903134	29
ash	6.582594	115
elm	35.465086	25
maple	15.766389	63
sycamore	36.379711	110
beech	28.268448	40
ash	31.397243	99
elm	18.517488	99
maple	28.823234	72
sycamore	28.858379	73
beech	8.060898	34
ash	34.694842	88
elm	21.227169	103
maple	20.789003	67
sycamore	5.464636	111
beech	18.221045	40
ash	23.572341	65
elm	16.128950	78
maple	39.221586	71
sycamore	34.064109	112
beech	22.823254	117
ash	16.107606	59

species	dbh	age
elm	31.412299	99
maple	14.301667	108
sycamore	13.495726	33
beech	35.563361	100
ash	20.350248	100
elm	6.479554	74
maple	34.554516	66
sycamore	6.153258	45
beech	38.462263	89
ash	25.040311	70
elm	33.003961	68
maple	39.740898	22
sycamore	14.037295	104
beech	25.109435	38
ash	31.948508	66
elm	21.998141	79
maple	13.225884	44
sycamore	32.093805	85
beech	29.552895	116
ash	21.772292	92
elm	12.623135	39
maple	37.886395	76
sycamore	26.589330	69
beech	22.457700	117
ash	5.915094	47
elm	11.906434	82
maple	6.783141	74
sycamore	14.684739	89
beech	38.473724	39
ash	7.001651	24
elm	5.881051	28
maple	32.913674	35
sycamore	10.432873	80
beech	30.676020	80
ash	28.439690	58
elm	5.183506	44
maple	31.533047	103
sycamore	14.069628	72
beech	36.106217	24
ash	13.369217	113
elm	15.573841	45

species	dbh	age
maple	20.503041	65
sycamore	27.824678	28
beech	35.685208	26
ash	30.168768	23
elm	10.182187	81
maple	23.196161	38
sycamore	39.480306	92
beech	19.605731	56
ash	9.248206	58
elm	26.402371	48
maple	5.412345	61
sycamore	18.879057	104
beech	37.590255	54
ash	20.982300	93
elm	33.570737	41
maple	39.147252	103
sycamore	18.013256	114
beech	29.459367	106
ash	16.397009	80
elm	24.289191	52
maple	26.379787	111
sycamore	27.030762	109
beech	23.856859	36
ash	16.227416	37
elm	38.557839	93
maple	20.207973	112
sycamore	18.276160	35
beech	16.346004	29
ash	14.641058	62
elm	12.194734	21
maple	33.289333	51
sycamore	22.184364	95
beech	12.231942	24
ash	19.598883	54
elm	28.886417	109
maple	5.301439	28
sycamore	32.198566	64
beech	25.840199	87
ash	31.700178	72
elm	38.854138	62
maple	17.195720	31

species	dbh	age
sycamore	13.535357	66
beech	30.451491	76
ash	30.208220	31
elm	10.320936	92
maple	14.031847	35
sycamore	32.070404	113
beech	7.557059	56
ash	9.693760	75
elm	33.213005	114
maple	18.586024	55
sycamore	33.356090	54
beech	27.621806	55
ash	19.878239	60
elm	6.328824	89
maple	17.467950	42
sycamore	28.705810	97
beech	38.572616	27
ash	21.921200	105
elm	5.882015	26
maple	17.224443	95
sycamore	11.144815	59
beech	30.721523	75
ash	31.089054	51
elm	10.981030	92
maple	7.999222	118
sycamore	23.121387	94
beech	21.696210	107
ash	25.456123	72
elm	31.890229	44
maple	32.570559	88
sycamore	15.022879	103
beech	13.601822	60
ash	16.012817	87
elm	26.485338	56
maple	33.294767	65
sycamore	8.768550	44
beech	33.398899	67
ash	21.827025	62
elm	33.347179	68
maple	32.690425	109
sycamore	21.520964	50

species	dbh	age
beech	7.534485	51
ash	9.019292	52
elm	28.141417	24
maple	25.774356	105
sycamore	24.811242	84
beech	27.714324	43
ash	14.011637	34
elm	36.114202	77
maple	34.667347	72
sycamore	36.334699	43
beech	9.025190	105
ash	35.700573	74
elm	38.051683	57
maple	6.168635	54
sycamore	26.200303	108
beech	25.830076	92
ash	35.270737	81
elm	13.999843	109
maple	8.021445	89
sycamore	12.125467	51
beech	28.337453	45
ash	29.331106	67
elm	33.047503	30
maple	11.701738	38
sycamore	32.420077	91
beech	26.045249	86
ash	29.456374	102
elm	19.806934	24
maple	26.052081	72
sycamore	31.710511	113
beech	7.031836	95
ash	17.751345	107
elm	28.109164	39
maple	13.525772	29
sycamore	7.660293	87
beech	14.977394	69
ash	12.344184	55
elm	35.594130	106
maple	10.804180	40
sycamore	6.559926	47

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

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

species	dbh
beech	10.044094
ash	32.757767
elm	8.925053
maple	13.807362
sycamore	23.551105
beech	19.234133
ash	29.784401
elm	19.914805
maple	8.917980
sycamore	35.235702
beech	24.112720
ash	30.786224

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
2	ash	32.75777	67
5	sycamore	23.55111	102
6	beech	19.23413	72
7	ash	29.78440	27
8	elm	19.91480	35
10	sycamore	35.23570	103
11	beech	24.11272	107
12	ash	30.78622	23
13	elm	23.87352	113
15	sycamore	26.67719	75
16	beech	24.90313	29
18	elm	35.46509	25
19	maple	15.76639	63
20	sycamore	36.37971	110
21	beech	28.26845	40
22	ash	31.39724	99
23	elm	18.51749	99
24	maple	28.82323	72
25	sycamore	28.85838	73
27	ash	34.69484	88
28	elm	21.22717	103

	species	dbh	age
29	maple	20.78900	67
31	beech	18.22105	40
32	ash	23.57234	65
33	elm	16.12895	78
34	maple	39.22159	71
35	sycamore	34.06411	112
36	beech	22.82325	117
37	ash	16.10761	59
38	elm	31.41230	99
41	beech	35.56336	100
42	ash	20.35025	100
44	maple	34.55452	66
46	beech	38.46226	89
47	ash	25.04031	70
48	elm	33.00396	68
49	maple	39.74090	22
51	beech	25.10943	38
52	ash	31.94851	66
53	elm	21.99814	79
55	sycamore	32.09380	85
56	beech	29.55290	116
57	ash	21.77229	92
59	maple	37.88640	76
60	sycamore	26.58933	69
61	beech	22.45770	117
66	beech	38.47372	39
69	maple	32.91367	35
71	beech	30.67602	80
72	ash	28.43969	58
74	maple	31.53305	103
76	beech	36.10622	24
78	elm	15.57384	45
79	maple	20.50304	65
80	sycamore	27.82468	28
81	beech	35.68521	26
82	ash	30.16877	23
84	maple	23.19616	38
85	sycamore	39.48031	92
86	beech	19.60573	56
88	elm	26.40237	48
90	sycamore	18.87906	104

	species	dbh	age
91	beech	37.59025	54
92	ash	20.98230	93
93	elm	33.57074	41
94	maple	39.14725	103
95	sycamore	18.01326	114
96	beech	29.45937	106
97	ash	16.39701	80
98	elm	24.28919	52
99	maple	26.37979	111
100	sycamore	27.03076	109
101	beech	23.85686	36
102	ash	16.22742	37
103	elm	38.55784	93
104	maple	20.20797	112
105	sycamore	18.27616	35
106	beech	16.34600	29
109	maple	33.28933	51
110	sycamore	22.18436	95
112	ash	19.59888	54
113	elm	28.88642	109
115	sycamore	32.19857	64
116	beech	25.84020	87
117	ash	31.70018	72
118	elm	38.85414	62
119	maple	17.19572	31
121	beech	30.45149	76
122	ash	30.20822	31
125	sycamore	32.07040	113
128	elm	33.21300	114
129	maple	18.58602	55
130	sycamore	33.35609	54
131	beech	27.62181	55
132	ash	19.87824	60
134	maple	17.46795	42
135	sycamore	28.70581	97
136	beech	38.57262	27
137	ash	21.92120	105
139	maple	17.22444	95
141	beech	30.72152	75
142	ash	31.08905	51
145	sycamore	23.12139	94

	species	dbh	age
146	beech	21.69621	107
147	ash	25.45612	72
148	elm	31.89023	44
149	maple	32.57056	88
150	sycamore	15.02288	103
152	ash	16.01282	87
153	elm	26.48534	56
154	maple	33.29477	65
156	beech	33.39890	67
157	ash	21.82703	62
158	elm	33.34718	68
159	maple	32.69043	109
160	sycamore	21.52096	50
163	elm	28.14142	24
164	maple	25.77436	105
165	sycamore	24.81124	84
166	beech	27.71432	43
168	elm	36.11420	77
169	maple	34.66735	72
170	sycamore	36.33470	43
172	ash	35.70057	74
173	elm	38.05168	57
175	sycamore	26.20030	108
176	beech	25.83008	92
177	ash	35.27074	81
181	beech	28.33745	45
182	ash	29.33111	67
183	elm	33.04750	30
185	sycamore	32.42008	91
186	beech	26.04525	86
187	ash	29.45637	102
188	elm	19.80693	24
189	maple	26.05208	72
190	sycamore	31.71051	113
192	ash	17.75135	107
193	elm	28.10916	39
198	elm	35.59413	106

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.

```r
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.

```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)
```

species	family	range...	conservation...		OWS...	OWS_...		GEN_Av...		WSP_Female_aver...	WSP_Fe...								ELT_sin...					FM_Aver...			AFB_Avey...		AFB_hon...	AFB_min...	...flower
Aglais_ichnusa	Nymphalidae	NA	NA	0	0	0	1	2.00	2.02	0.04	7.00	[illegible]	0.57	NA	NA	NA	NA	NA	NA	NA	NA	700	1800	8.00	1	0	0	0	0	0	0	
Aglais_io	Nymphalidae	[illegible]	5	0	0	0	1	2.00	1.03	2.05	53.5	[illegible]	0.23	36	0	1	0	0	0	0	1	0	2500	7.53	1	0	1	0	0	1	1	
Aglais_urticae	Nymphalidae	[illegible]	5	0	0	0	1	2.00	1.03	2.04	48.0	[illegible]	0.70	70	0	1	0	0	0	0	1	0	3000	7.53	1	0	1	0	0	1	1	
Agriades_orbitulus	Lycaenidae	[illegible]	5	5	0	1	0	0	0.75	5.51	0.52	23.2	0.28	89	0	1	0	0	NA	NA	NA	0	900	3.00	NA	NA	NA	NA	NA	NA	NA	

species	family																														
Agriades_dardanus	Lycaenidae	2	4	4	NA	NA	NA	NA	1.00	0.01	0.02	5.0	6	0.5	77	NA	NA	NA	NA	NA	NA	800	340	4.00	NA	NA	NA	NA	NA	NA	NA
Agriades_glandon	Lycaenidae	45	5	5	0	1	0	0	1.00	0.01	0.02	3.0	2	0.35	40	1	0	0	NA	NA	NA	1600	110	2.00	1	0	0	0	0	0	0

> Use a text editor outside of Rstudio to look at the data file as well. Why do you think this is a good format to store data in? WHat is the advantage to e.g., an Excel file? What does using a text file format mean for your data entry requirements?

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`.

```
save.image("myenv.Rdata")
```

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

All of the functions we used today are so "base `R`" functions, which means they come preinstalled with `R`. Lots of the functionality of `R` is in external packages which need to be installed manually. The majority of relevant packages are found on CRAN (The Comprehensive R Archive Network), and there is a special archive for packages relevant to the life sciences (Bioconductor). In order to install packages from CRAN, simply run

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

Here, `tidyverse` is the package we want to install we ask to also install any packages that `tidyverse` may require to function. You can find a list of all packages currently installed in the packages tab in the panel on the bottom left in RStudio. It is good practise to keep the packages, as well as your `R` installation up to date.

3.2 Functions

We have already used plenty of functions. Most of them require at least an object an which to perform the function on, and may also have some options. For example, consider the following function:

```
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 t 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
```

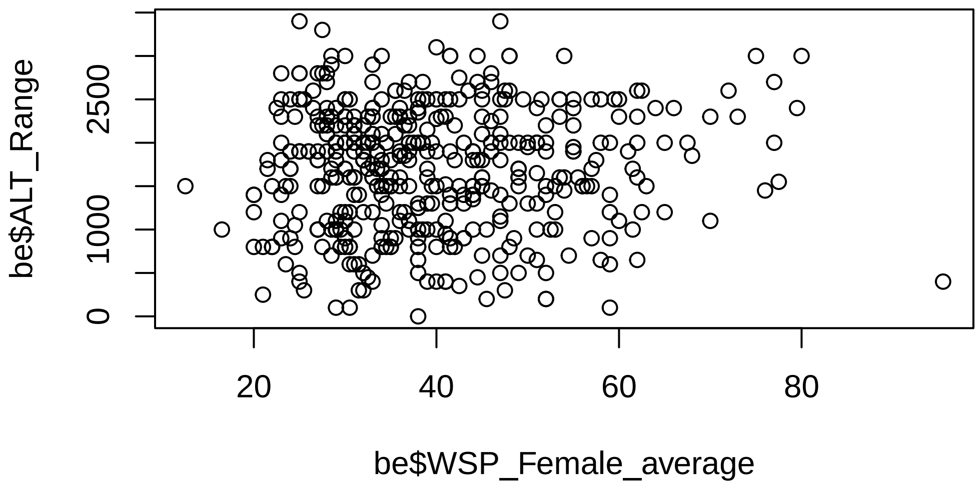
Observe and try to explain what happens in each iteration to the variables used in these examples.

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 othe options because of simplicity and speed.

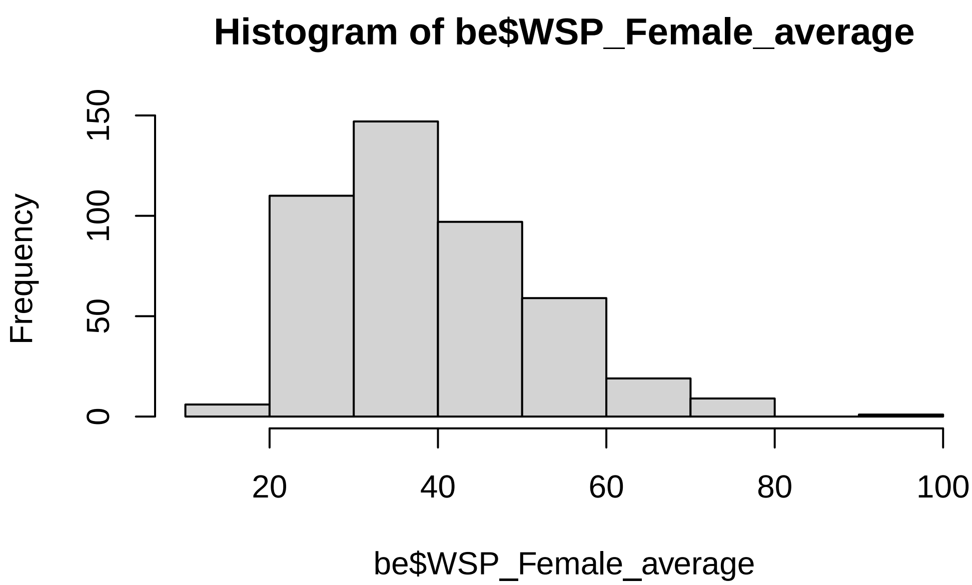
Scatter plots can be created by just naming the variables to be plotted against each other.

```
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 6.2 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)
```

species	family	range	conservation	[illegible]	[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	GEN_Average	[illegible]	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	AFB_honey[illegible]	AFB_[illegible]	[illegible]	[illegible]	[illegible]	AFB_mini[illegible]	AFB_min[illegible]flower
Aglais_ichnusa	Nymphalidae	NA	NA	0	0	0	1	2.00	2.02	0.04	47.00	0.57	77	NA	NA	NA	NA	NA	NA	NA	700	1800	8.00	1	0	0	0	0	0	0		
Aglais_io	Nymphalidae	1135	5	0	0	0	1	2.00	1.03	2.05	53.57	0.23	36	0	1	0	0	0	0	1	0	2500	7.53	1	0	1	0	0	1	1		
Aglais_urticae	Nymphalidae	1271	5	0	0	0	1	2.00	1.03	2.04	48.00	0.70	70	0	1	0	0	0	0	1	0	3000	7.53	1	0	1	0	0	1	1		
Agriades_aquilo	Lycaenidae	21	5	5	0	1	0	0	0.75	5.51	0.52	23.2	0.28	89	0	1	0	0	NA	NA	NA	0	900	3.00	NA	NA	NA	NA	NA	NA	NA	
Agriades_dardanus	Lycaenidae	2	4	4	NA	NA	NA	NA	1.00	0.01	0.02	25.6	0.57	77	NA	NA	NA	NA	NA	NA	NA	800	3400	4.00	NA	NA	NA	NA	NA	NA	NA	
Agriades_glandon	Lycaenidae	45	5	5	0	1	0	0	1.00	0.01	0.02	23.2	0.35	54	0	1	0	0	NA	NA	NA	1600	1100	2.00	1	0	0	0	0	0	0	

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)
```

species	families		conservation					GEN_Average				WSP_Female_average							ELT_single					FM_Average			AFB_honeydew	AFB_animal	AFB_mineral			
Argynnis_paphia	Nymphalidae	1024	4.5	1	1	0	0	1.00	1.0	1.0	0.0	62.8	0.25	58	0	1	0	0	1	0	0	0	230	4.0	2	1	0	1	1	0	0	1

species	families	range	conservation	conservation	OWS	OWS	OWS_larva	OWS_pupa	GEN_Average	GEN	GEN	GEN	WSP_Female_average	WSP_Female						ELT_single					FM_Average					AFB_honey	AFB	AFB_min	flower
Aricia_cramera	Lycaenidae	138	5	5	1	1	1	1	2.50	2.0	3.0	1.0	25.6	0.10	121	1	1	0	0	1	0	0	0	250	9.55	1	0	0	0	0	0	1	
Azanus_ubaldus	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	12.5	0.50	770	0	0	1	0	1	1	0	0	150	NA	NA	0	0	1	0	0	0	0
Boloria_titania	Nymphalidae	141	5	1	1	0	0	1.00	1.0	1.0	0.0	39.5	0.50	000	0	1	0	0	1	0	0	100	200	3.00	1	0	0	0	0	0	0		
Brenthis_daphne	Nymphalidae	323	5	1	1	0	0	1.00	1.0	1.0	0.0	47.00	0.40	470	0	0	1	0	1	0	0	0	230	3.51	1	0	1	0	0	0	0		
Brenthis_hecate	Nymphalidae	190	5	1	0	0	0	1.00	1.0	1.0	0.0	40.8	0.40	080	0	1	0	0	1	0	0	25	227	3.50	1	0	0	0	0	0	0		
Brenthis_ino	Nymphalidae	699	5	1	1	0	0	1.00	1.0	1.0	0.0	37.8	0.20	041	1	0	0	1	1	0	0	200	2.51	1	0	1	0	0	0	0			
Catopsilia_florella	Pieridae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	50.00	NA	0	0	0	1	1	1	1	0	0	200	11.2	NA	NA	NA	NA	NA	NA	NA	
Colias_palaeno	Pieridae	417	5	5	1	1	0	0	1.00	1.0	1.0	0.0	47.00	0.70	071	1	0	0	1	0	0	0	250	3.00	1	0	1	0	0	0	0		
Cyclyrius_webbianus	Lycaenidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	27.5	0.28	890	1	0	0	0	1	0	200	330	NA	NA	1	0	0	0	0	0	0	
Danaus_plexippus	Nymphalidae	38	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	70.00	0.35	540	1	0	0	NA	NA	NA	0	1100	10.3	1	0	0	0	0	0	0		
Erebia_eriphyle	Nymphalidae	345	5	1	1	0	0	0.50	0.5	0.5	0.0	34.0	0.50	000	1	0	0	NA	NA	NA	1200	1050	3.00	1	0	0	0	0	0	0			
Erebia_euryale	Nymphalidae	203	5	1	1	0	0	0.75	0.5	1.0	0.5	44.0	0.09	960	1	0	0	1	0	0	600	1900	3.02	1	0	0	0	0	0	0			

species	families								GEN_Average				WSP_Female_average	WSP_Fe-							ELT_sin-					FM_Average							flower
Erebia_ligea	Nymphalidae	564	5	5	1	1	0	0	0.75	0.5	1.0	0.5	41.0	1.00	0.18	0.83	1	1	0	0	1	0	0	0	250	3.02	1	0	0	0	0	0	1
Erebia_manto	Nymphalidae	895	5	5	1	1	0	0	0.50	0.5	0.5	0.0	39.0	1.00	0.30	0.16	0	1	0	0	1	0	0	900	160	3.00	1	0	0	0	0	0	0
Fabriciana_adippe	Nymphalidae	888	5	5	1	1	0	0	1.00	1.0	1.0	0.0	53.5		0.50	0.00	0	1	0	0	1	0	0	0	230	3.53	1	0	1	0	0	0	1
Fabriciana_elisa	Nymphalidae	8	5	5	1	1	0	0	1.00	1.0	1.0	0.0	49.6		1.00	0.00	0	1	0	0	1	0	0	400	160	3.00	1	0	0	0	0	0	0
Fabriciana_niobe	Nymphalidae	646	5	4	1	1	0	0	1.00	1.0	1.0	0.0	49.5		0.40	0.08	1	1	0	0	1	0	0	0	250	2.53	1	0	0	0	0	0	0
Favonius_quercus	Lycaenidae	777	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.6		0.40	0.08	0	0	0	1	1	0	0	0	200	5.02	0	0	0	1	0	1	1
Gegenes_nostrodamus	Hesperiidae	65	5	5	1	1	1	1	3.00	3.0	3.0	0.0	32.4		0.28	0.89	0	1	0	0	1	0	0	0	190	9.00	1	0	0	0	0	0	1
Gonepteryx_cleopatra	Pieridae	NA	3	[illegible]	[illegible]	[illegible]	1	1	3.00	3.0	3.0	0.0	61.5	[illegible]	0.50	0.77	0	0	1	1	1	0	0	300	170	4.04	1	0	0	0	0	0	0
Hesperia_comma	Hesperiidae	807	5	5	1	1	0	0	1.00	1.0	1.0	0.0	31.6		0.33	0.33	1	1	0	0	1	0	0	0	220	3.53	1	0	0	0	0	0	0
Issoria_lathonia	Nymphalidae	976	5	5	1	1	1	1	2.00	1.0	3.0	2.0	42.5		0.40	0.08	1	1	0	0	1	0	0	0	275	7.06	1	0	0	0	0	0	1
Laeosopis_roboris	Lycaenidae	82	5	5	1	0	0	0	1.00	1.0	1.0	0.0	27.6		0.70	0.07	1	0	0	1	1	0	0	100	150	3.00	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	1	1	1	0	3.00	3.0	3.0	0.0	33.6		0.05	0.58	0	1	0	0	1	0	0	0	270	9.00	1	0	0	0	0	0	0

species	families	range	conservation	consize	OWS	OWS_larva	OWS_pupa	GEN_Average	GEN	GEN	WSP_Female_average	WSP_Female						ELT_single					FM_Average						AFB_honeydew	AFB_animals	AFB_min-flower
Lycaena_hippothoe	Lycaenidae	6895	4	1	1	0	0	1.00	1.0	1.0	0.0	30.57	0.2891	1	0	0	1	0	0	0	2504.051	1	0	0	0	0	0	0			
Lysandra_albicans	Lycaenidae	40	5	5	1	0	0	0	1.00	1.0	1.0	0.0	39.60	1.0000	0	1	0	0	NA	NA	NA	500	1003.00	1	0	0	0	0	0	1	
Lysandra_coridon	Lycaenidae	5754	4	1	0	0	0	1.50	1.0	2.0	1.0	33.60	1.0001	0	0	0	1	0	0	100	2403.00	1	0	0	0	0	1	1			
Lysandra_hispana	Lycaenidae	50	5	5	1	0	0	0	2.00	2.0	2.0	0.0	34.04	1.0000	0	1	0	0	1	0	0	1009007.00	1	0	0	0	0	0	1		
Maculinea	Hesperiidae	885	5	1	0	0	0	1.00	1.0	1.0	0.0	34.59	0.5771	1	0	0	1	0	0	0	2004.002	1	0	0	0	0	0	1			
Parnassius	Nymphalidae	NA	2	1	1	1	1	3.00	3.0	3.0	0.0	45.53	0.1021	1	0	0	1	0	0	0	10012.00	0	0	1	1	1	0	0			
Parnassius	Nymphalidae	NA	1	1	1	1		3.00	3.0	3.0	0.0	37.51	0.1021	1	0	0	1	0	0	0	20012.00	0	0	1	1	1	0	0			
Parnassius_apollo	Papilionidae	354	4	4	1	1	0	0	1.00	1.0	1.0	0.0	80.00	0.2041	0	0	0	1	1	0	0	3004.051	1	0	0	0	0	0	0		
Parnassius_mnemosyne	Papilionidae	371	4	5	1	0	0	0	1.00	1.0	1.0	0.0	58.02	0.3541	0	0	0	1	0	0	0	2503.00	1	0	0	0	0	0	0		
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	1.0	1.0	0.0	65.00	0.1581	1	0	0	1	0	0	1601200.00	1	0	0	0	0	0	0			
Pieris_mannii	Pieridae	NA	2	1	1	1	1	3.00	3.0	3.0	0.0	62.5	0.2891	1	1	0	0	1	1	200	120012.00	1	0	0	0	0	0	0			

species	families												WSP_Female_average												FM_Average						AFB_min_flower
Plebejus_argus	Lycaenidae	991	5	5	1	0	0	0	1.5	1.0	2.0	1.0	22.5	0.069	1	1	0	0	1	0	0	0	240	4.00	1	0	0	0	0	1	1
Plebejus_argyrognomon	Lycaenidae	290	5	5	1	1	0	0	1.5	1.0	2.0	1.0	31.6	0.224	0	1	0	0	1	0	0	300	140	4.00	1	0	0	0	0	0	0
Plebejus_idas	Lycaenidae	774	5	5	1	0	0	0	1.5	1.0	2.0	1.0	24.5	0.041	0	1	0	0	1	0	0	100	230	5.00	1	0	0	0	0	0	0
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.0	1.0	1.0	0.0	32.0	0.447	1	0	0	0	1	0	0	600	180	2.00	1	0	0	0	0	0	1
Polyommatus_daphnis	Lycaenidae	305	5	5	1	0	0	0	1.0	1.0	1.0	0.0	35.0	0.129	1	1	0	0	1	0	0	200	180	3.00	1	0	0	0	0	0	1
Pyrgus_cirsii	Hesperiidae	94	3	3	1	1	0	0	1.0	1.0	1.0	0.0	27.0	0.408	1	1	0	0	1	0	0	0	100	3.02	1	0	0	0	0	0	1
Satyrium_acaciae	Lycaenidae	349	5	5	1	0	0	0	1.0	1.0	1.0	0.0	30.0	1.000	1	0	1	0	1	0	0	0	200	3.02	1	0	1	0	0	0	0
Satyrium_esculi	Lycaenidae	106	5	5	1	0	0	0	1.0	1.0	1.0	0.0	32.0	0.707	0	0	1	1	1	0	0	100	120	4.00	1	0	0	0	0	0	0
Satyrium_ilicis	Lycaenidae	586	5	5	1	0	0	0	1.0	1.0	1.0	0.0	34.0	0.112	0	0	1	0	1	0	0	0	180	4.00	0	0	1	0	0	0	0
Satyrium_ereri	Lycaenidae	1	NA	NA	1	0	0	0	1.0	1.0	1.0	0.0	29.0	0.577	0	0	1	0	1	0	0	600	190	3.53	1	0	0	0	0	0	0
Satyrium_pruni	Lycaenidae	408	5	5	1	0	0	0	1.0	1.0	1.0	0.0	31.5	0.134	0	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Satyrium_spini	Lycaenidae	485	5	5	1	0	0	0	1.0	1.0	1.0	0.0	30.0	0.167	0	0	1	0	1	1	0	0	200	3.51	1	0	1	1	0	0	0
Satyrium_w-album	Lycaenidae	553	5	5	1	0	0	0	1.0	1.0	1.0	0.0	30.0	0.065	0	0	1	1	1	0	0	0	170	3.00	1	0	0	1	0	0	0

species	families	range	conservation	con...	OWS...	OWS...	OWS_egg...	OWS...	GEN_Av...				WSP_Female_average...		WSP_Fe...					ELT_sin...					FM_Average...				AFB_Av...		AFB_min...	AFB_... flower
Speyeria_aglaja	Nymphalidae	1132	[illegible]	5	1	1	0	0	1.00	1.0	1.0	0.05	51.5	9	0.500	1	1	0	0	1	0	0	0	2500	3.53	1	0	0	0	0	1	1
Thecla_betulae	Lycaenidae	628	5	5	1	0	0	0	1.00	1.0	1.0	0.03	35.1	0	0.129	0	0	1	0	1	0	0	0	1600	4.51	1	0	0	1	0	0	0
Thymelicus_lineola	Hesperiidae	926	[illegible]	5	1	0	0	0	1.00	1.0	1.0	0.02	25.5	7	0.067	0	1	0	0	0	1	1	0	2500	3.53	1	0	0	0	0	0	1
Vanessa_cardui	Nymphalidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.05	57.0	6	0.289	0	1	0	0	1	0	0	0	1500	12.00	1	0	0	0	0	0	0
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.02	22.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA
Zizeeria_knysna	Lycaenidae	39	NA	NA	1	1	1	1	3.00	3.0	3.0	0.02	22.0	4	0.105	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1

The filtering criterion can be specified using the methods you are already familiar with (e.g., `>`, `>=`, `!=`, `%in%`).

Notice that the variable names can be used directly here, so instead of using `be$OWS_egg`, `filter()` lets you use `OWS_egg` directly. All `tidyverse` functions work like that. Let's look at more complex filtering:

```
# combine 2 filters with boolean "AND" ...
filter(be, OWS_egg == 1 , ALT_Min > 500)
```

species	family								GEN_Average				WSP_Female_average							ELT_single					FM_Average				AFB_honeydew			
Erebia_eriphyle	Nymphalidae	34	5	5	1	1	0	0	0.50	0.5	0.5	0.0	34	4	0.500	0	1	0	0	NA	NA	NA	1200	105	3.00	1	0	0	0	0	0	0
Erebia_euryale	Nymphalidae	203	5	5	1	1	0	0	0.75	0.5	1.0	0.5	44	4	0.096	0	1	0	0	1	0	0	600	190	3.02	1	0	0	0	0	0	0
Erebia_manto	Nymphalidae	89	5	5	1	1	0	0	0.50	0.5	0.5	0.0	39	10	0.316	0	1	0	0	1	0	0	900	160	3.00	1	0	0	0	0	0	0
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	0.0	1.0	0.0	65	30	0.158	1	1	0	0	1	0	0	1600	120	3.00	1	0	0	0	0	0	0
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.00	0.0	1.0	0.0	32	4	0.447	1	0	0	0	1	0	0	600	180	2.00	1	0	0	0	0	0	1
Satyrium_ereri	Lycaenidae	[illegible]	NA	NA	1	0	0	0	1.00	0.0	1.0	0.0	29	4	0.577	0	0	1	0	1	0	0	600	190	3.53	1	0	0	0	0	0	0

```r
# ... or boolean "OR"
filter(be, OWS_egg == 1 | AFB_honeydew == 1)
```

species	family								GEN_Average				WSP_Female_average							ELT_single					FM_Average				AFB_honeydew			
Apatura_ilia	Nymphalidae	528	5	5	0	1	0	0	1.50	0.0	2.0	1.0	68.8	8	0.267	0	0	1	1	1	0	0	50	185	4.53	1	0	0	1	1	1	1
Apatura_iris	Nymphalidae	575	5	5	0	1	0	0	1.00	0.0	1.0	0.0	70.1	10	0.316	0	0	1	0	1	0	0	0	230	2.51	1	0	0	1	1	1	1
Apatura_metis	Nymphalidae	475	5	5	0	1	0	0	1.50	0.0	2.0	1.0	62.0	4	1.000	0	0	1	1	1	0	0	0	650	4.00	1	0	1	1	1	1	1

species	family	con-serv- range	con-	size	OWS	OWS_lar-	OWS_pu-	OWS_egg	GEN_Av-er-age				WSP_Fe-male_av-er-age	WSP_Fe-							ELT_sin-					FM_Av-er-					AFB_hon-ey-	AFB_		AFB_min-flower
Aporia_crataegi	Pieridae	894	5	5	0	1	0	0	1.00	1.0	1.0	0.0	62.5	1	0.08	82	0	1	1	0	0	0	1	0	260	3.51		1	1	0	1	0	0	1
Argynnis_paphia	Nymphalidae	102	4	5	1	1	0	0	1.00	1.0	1.0	0.0	62.8	0	0.25	58	0	1	0	0	1	0	0	0	230	4.02		1	0	1	1	0	0	1
Aricia_cramera	Lycaenidae	138	5	5	1	1	1	1	2.50	2.0	3.0	1.0	25.6	0	0.10	12	1	1	0	0	1	0	0	0	250	9.55		1	0	0	0	0	0	1
Azanus_ubaldus	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	12.5		0.50	77	0	0	1	0	1	1	0	0	1500	NA	NA	0	0	1	0	0	0	0
Boloria_titania	Nymphalidae	144	1	5	1	1	0	0	1.00	1.0	1.0	0.0	39.5	0	0.50	00	0	1	0	0	1	0	0	100	200	3.00	0	1	0	0	0	0	0	0
Brenthis_daphne	Nymphalidae	323	5	5	1	1	0	0	1.00	1.0	1.0	0.0	47.1	00	0.40	47	0	0	1	0	1	0	0	0	230	3.51		1	0	1	0	0	0	0
Brenthis_hecate	Nymphalidae	190	5	5	1	0	0	0	1.00	1.0	1.0	0.0	40.8	0	0.40	08	0	1	0	0	1	0	0	25	227	3.50	0	1	0	0	0	0	0	0
Brenthis_ino	Nymphalidae	699	5	5	1	1	0	0	1.00	1.0	1.0	0.0	37.8	0	0.20	04	1	1	0	0	1	1	0	0	200	2.51		1	0	1	0	0	0	0
Callophrys_rubi	Lycaenidae	119	2	5	0	0	1	0	1.25	1.0	1.5	0.5	23.6	0	0.03	33	1	1	1	0	1	0	0	0	230	6.02		1	0	1	1	0	0	0
Catopsilia_florella	Pieridae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	50.1	00	NA	0	0	0	1	1	1	1	0	0	200	11.2	0	NA	NA	NA	NA	NA	NA	NA
Celastrina_argiolus	Lycaenidae	119	0	5	0	0	1	0	1.75	1.0	2.5	1.5	27.1	00	0.02	00	0	0	1	1	1	0	0	0	190	7.00	0	1	0	1	1	0	0	0
Coenonympha_oedippus	Nymphalidae	52	2		0	1	0	0	1.00	1.0	1.0	0.0	38.8	0	0.25	58	0	1	0	0	1	0	0	0	500	3.00	0	1	0	1	1	0	0	0

species	family																															
Colias_palaeno	Pieridae	417	5	5	1	1	0	0	1.00	1.0	1.0	0.0	47.00	0.707	1	1	0	0	1	0	0	0	250	3.0	0	1	0	1	0	0	0	0
Cyclyrius_webbianus	Lycaenidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	27.5	0.289	0	1	0	0	0	1	0	200	330	NA	NA	1	0	0	0	0	0	0
Danaus_plexippus	Nymphalidae	38	NA	NA	1	[illegible]	1	1	3.00	3.0	3.0	0.0	70.20	0.354	0	1	0	0	NA	NA	NA	0	1100	10.3	5	1	0	0	0	0	0	0
Erebia_eriphyle	Nymphalidae	34	5	5	1	1	0	0	0.50	0.5	0.5	0.0	34.0	0.500	0	1	0	0	NA	NA	NA	1200	105	3.0	0	1	0	0	0	0	0	0
Erebia_euryale	Nymphalidae	203	5	5	1	1	0	0	0.75	0.5	1.0	0.5	44.0	0.096	0	1	0	0	1	0	0	600	190	3.0	2	1	0	0	0	0	0	0
Erebia_ligea	Nymphalidae	564	5	5	1	1	0	0	0.75	0.5	1.0	0.5	41.00	0.183	1	1	0	0	1	0	0	0	250	3.0	2	1	0	0	0	0	0	1
Erebia_manto	Nymphalidae	89	5	5	1	1	0	0	0.50	0.5	0.5	0.0	39.00	0.316	0	1	0	0	1	0	0	900	160	3.0	0	1	0	0	0	0	0	0
Euphydryas_maturna	Nymphalidae	218	[illegible]	5	0	1	1	0	0.75	0.5	1.0	0.5	41.5	0.046	0	1	1	1	0	0	1	100	900	2.5	1	1	0	0	1	0	0	0
Fabriciana_adippe	Nymphalidae	888	5	5	1	1	0	0	1.00	1.0	1.0	0.0	53.5	0.500	0	1	0	0	1	0	0	0	230	3.0	53	1	0	1	0	0	0	1
Fabriciana_elisa	Nymphalidae	8	5	5	1	1	0	0	1.00	1.0	1.0	0.0	49.6	1.000	0	1	0	0	1	0	0	400	160	3.0	0	1	0	0	0	0	0	0
Fabriciana_niobe	Nymphalidae	646	5	4	1	1	0	0	1.00	1.0	1.0	0.0	49.5	0.408	1	1	0	0	1	0	0	0	250	2.0	53	1	0	0	0	0	0	0
Favonius_quercus	Lycaenidae	777	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.6	0.408	0	0	0	1	1	0	0	0	200	5.0	2	0	0	0	1	0	1	1

species	families	range	conservation	con...	OWS	OWS_...	OWS_egg	OWS_...	GEN_Av...	GEN...			WSP_Female_average	WSP_Fe...						ELT_sin...				FM_Average						AFB_...	AFB_...	AFB_min... flower
Gegenes_nostrodamus	Hesperiidae	65	5	5	1	1	1	1	3.00	3.0	3.0	0.0	32.0	4	0.2889	0	1	0	0	1	0	0	0	190	9.00	1	0	0	0	0	0	1
Gonepteryx_cleobule	Pieridae	NA	3	3	[illegible]	[illegible]	1	1	3.00	3.0	3.0	0.0	61.5	13	0.5777	0	0	1	1	1	0	0	300	170	4.04	1	0	0	0	0	0	0
Hesperia_comma	Hesperiidae	807	5	5	1	1	0	0	1.00	1.0	1.0	0.0	31.0	6	0.3333	1	1	0	0	1	0	0	0	220	3.53	1	0	0	0	0	0	0
Hyponephele_lupina	Nymphalidae	143	5	5	0	1	0	0	1.00	1.0	1.0	0.0	45.0	6	0.1669	1	1	0	0	1	0	0	0	230	4.55	1	0	0	1	1	0	0
Issoria_lathonia	Nymphalidae	976	5	5	1	1	1	1	2.00	1.0	3.0	2.0	42.5		0.4008	1	1	0	0	1	0	0	0	275	7.06	1	0	0	0	0	0	1
Laeosopis_roboris	Lycaenidae	82	5	5	1	0	0	0	1.00	1.0	1.0	0.0	27.0	6	0.7007	1	0	0	1	1	0	0	100	150	3.00	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	1	1	1	0	3.00	3.0	3.0	0.0	33.0	6	0.0558	0	1	0	0	1	0	0	0	270	9.00	1	0	0	0	0	0	0
Leptidea_reali	Pieridae	NA	5	5	0	0	1	0	2.00	1.0	3.0	2.0	38.0	10	1.0000	0	1	0	0	1	0	0	0	200	6.04	0	0	1	1	1	1	1
Limenitis_camilla	Nymphalidae	526	5	5	0	1	0	0	1.00	1.0	1.0	0.0	56.0	8	0.2889	0	0	1	1	1	0	0	0	150	3.02	1	1	1	1	1	1	1
Limenitis_reducta	Nymphalidae	410	5	5	0	1	0	0	2.00	1.0	3.0	2.0	50.0	8	0.5777	0	0	1	0	1	0	0	0	195	5.04	1	0	1	1	1	1	1
Lopinga_achine	Nymphalidae	275	3	3	0	1	0	0	1.00	1.0	1.0	0.0	44.0	8	0.0886	1	1	0	0	1	0	0	100	140	2.51	1	0	0	1	1	0	1
Lycaena_dispar	Lycaenidae	383	5	5	0	1	0	0	2.00	1.0	3.0	2.0	37.0	8	0.4008	1	1	0	0	1	1	0	0	100	6.51	1	0	1	1	0	0	0

species	families																														
Lycaena_hippothoe	Lycaenidae	689	5	4	1	1	0	0	1.00	1.0	1.00	0.03	30.75	0.28	89	1	1	0	0	1	0	0	0	250	4.05	1	0	0	0	0	0	0
Lysandra_albicans	Lycaenidae	40	5	5	1	0	0	0	1.00	1.0	1.00	0.03	39.6	1.00	00	0	1	0	0	NA	NA	NA	500	100	3.00	1	0	0	0	0	0	1
Lysandra_coridon	Lycaenidae	575	4	4	1	0	0	0	1.50	1.0	2.0	1.0	33.6	1.00	01	0	0	0	1	0	0	100	240	3.00	1	0	0	0	0	1	1	
Lysandra_hispana	Lycaenidae	50	5	5	1	0	0	0	2.00	2.0	2.00	0.03	34.4	1.00	00	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1
Muschampia_proto	Hesperiidae	88	5	5	1	0	0	0	1.00	1.0	1.00	0.03	34.9	0.50	77	1	1	0	0	1	0	0	0	200	4.02	1	0	0	0	0	0	1
Nymphalis_antiopa	Nymphalidae	910	5	5	0	0	0	1	1.25	1.0	1.50	0.5	67.57	0.19	20	0	0	1	1	0	0	1	0	200	5.57	1	0	1	1	1	1	1
Pararge_xiphia	Nymphalidae	NA	2	2	1	1	1	1	3.00	3.0	3.00	0.04	45.3	0.10	21	1	1	0	0	1	0	0	0	100	12.0	0	0	1	1	1	0	0
Pararge_xiphioides	Nymphalidae	NA	1	1	1	1	1		3.00	3.0	3.00	0.03	37.5	0.10	21	1	1	0	0	1	0	0	0	200	12.0	0	0	1	1	1	0	0
Parnassius_apollo	Papilionidae	354	4	4	1	1	0	0	1.00	1.0	1.00	0.08	80.00	0.20	4	1	0	0	0	1	1	0	0	300	4.05	1	0	0	0	0	0	0
Parnassius_mnemosyne	Papilionidae	371	4	5	1	0	0	0	1.00	1.0	1.00	0.05	58.02	0.35	4	1	0	0	0	1	0	0	0	250	3.00	1	0	0	0	0	0	0
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	1.0	1.00	0.06	65.00	0.15	8	1	1	0	0	1	0	0	160	120	3.00	1	0	0	0	0	0	0

species	families																														
[illegible]	[illegible]	NA	2	2	1	1	1	1	3.00	3.0	3.0	0.0	62.5	0.289	1	1	1	0	0	1	1	200	1200	12.0	1	0	0	0	0	0	0
Plebejus_argus	Lycaenidae	991	5	5	1	0	0	0	1.50	1.0	2.0	1.0	22.5	0.069	1	1	0	0	1	0	0	0	2400	4.00	1	0	0	0	0	1	1
Plebejus_argyrognomon	Lycaenidae	290	5	5	1	1	0	0	1.50	1.0	2.0	1.0	31.6	0.224	0	1	0	0	1	0	0	300	1400	4.00	1	0	0	0	0	0	0
Plebejus_idas	Lycaenidae	774	5	5	1	0	0	0	1.50	1.0	2.0	1.0	24.5	0.041	0	1	0	0	1	0	0	100	2300	5.00	1	0	0	0	0	0	0
Polygonia_c-album	Nymphalidae	1098	5	[illegible]	0	0	0	1	2.00	1.0	3.0	2.0	46.12	0.050	0	1	1	1	1	0	0	0	2700	6.57	1	0	1	1	1	1	1
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.00	1.0	1.0	0.0	32.4	0.447	1	0	0	0	1	0	0	600	1800	2.00	1	0	0	0	0	0	1
Polyommatus_daphnis	Lycaenidae	305	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.6	0.129	1	1	0	0	1	0	0	200	1800	3.00	1	0	0	0	0	0	1
Polyommatus_violetae	Lycaenidae	3	3	3	0	1	0	0	1.00	1.0	1.0	0.0	31.6	1.000	0	1	0	0	NA	NA	NA	1200	600	2.00	1	0	0	1	0	0	1
Pyrgus_cirsii	Hesperiidae	94	3	3	1	1	0	0	1.00	1.0	1.0	0.0	27.2	0.408	1	1	0	0	1	0	0	0	1000	3.02	1	0	0	0	0	0	1
Satyrium_acaciae	Lycaenidae	349	5	[illegible]	1	0	0	0	1.00	1.0	1.0	0.0	30.4	1.000	1	0	1	0	1	0	0	0	2000	3.02	1	0	1	0	0	0	0

Satyrium_esculi	Lycaenidae	106	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.0	4	0.707	0	0	1	1	1	0	0	100	120	4.00	1	0	0	0	0	0	0
Satyrium_ilicis	Lycaenidae	586	5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.0	4	0.112	0	0	1	0	1	0	0	0	180	4.00	0	0	1	0	0	0	0
Satyrium_ledereri	Lycaenidae	1	NA	NA	1	0	0	0	1.00	1.0	1.0	0.0	29.0	4	0.577	0	0	1	0	1	0	0	600	190	3.53	1	0	0	0	0	0	0
Satyrium_pruni	Lycaenidae	408	5	5	1	0	0	0	1.00	1.0	1.0	0.0	31.5	9	0.134	0	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Satyrium_spini	Lycaenidae	483	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	4	0.167	0	0	1	0	1	1	0	0	200	3.51	1	0	1	1	0	0	0
Satyrium_w-album	Lycaenidae	553	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	4	0.065	0	0	1	1	1	0	0	0	170	3.00	1	0	0	1	0	0	0
Speyeria_aglaja	Nymphalidae	1132	5	5	1	1	0	0	1.00	1.0	1.0	0.0	51.5	9	0.500	1	1	0	0	1	0	0	0	250	3.53	1	0	0	0	0	1	1
Thecla_betulae	Lycaenidae	628	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.0	10	0.129	0	0	1	0	1	0	0	0	160	4.51	1	0	0	1	0	0	0
Thymelicus_lineola	Hesperiidae	926	5	5	1	0	0	0	1.00	1.0	1.0	0.0	25.5	7	0.067	0	1	0	0	0	1	1	0	250	3.53	1	0	0	0	0	0	1
Vanessa_atalanta	Nymphalidae	1343	5	5	0	0	0	1	2.00	10.0	3.0	2.0	59.5	13	0.316	0	1	0	0	1	0	0	0	250	8.57	1	0	1	1	1	1	1
Vanessa_cardui	Nymphalidae	1373	5	5	0	0	0	1	2.00	10.0	3.0	2.0	54.0	16	0.083	0	1	0	0	1	0	0	0	300	8.08	1	0	1	1	0	0	0
Vanessa_polychloros	Nymphalidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	57.6	0	0.289	0	1	0	0	1	0	0	0	1500	12.00	1	0	0	0	0	0	0
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA
Zizeeria_knysna	Lycaenidae	39	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	4	0.105	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1

NOTE

`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.

4.4 The pipe %>% for combining commands

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.

The "pipe" `%>%` (keyboard shortcut: `Ctrl+Shift+M`) simply passes the result of one function to the next function. For the next function, one does not have to specify the data frame. Let's see an example.

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

species	family	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Argynnis_paphia	Nymphalidae	1024	[illegible]	5	1	1	0	0	1.00	[illegible]	1.00	0.06	2.8	0.25	58	0	1	0	0	1	0	0	0	230	4.0	2	1	0	1	1	0	0	1
Aricia_agestis	Lycaenidae	138	5	5	1	1	1	1	2.50	[illegible]	3.0	1.02	5.6	0.10	12	1	1	0	0	1	0	0	0	250	9.5	5	1	0	0	0	0	0	1
Azanus_ubaldus	Lycaenidae	NA	NA	[illegible]	1	1	1	1	3.00	3.0	3.00	0.01	2.5	0.50	77	0	0	1	0	1	1	0	0	150	NA	NA	0	0	1	0	0	0	0
Boloria_titania	Nymphalidae	144	[illegible]	5	1	1	0	0	1.00	[illegible]	1.00	0.03	9.5	0.50	00	0	1	0	0	1	0	0	100	200	3.0	0	1	0	0	0	0	0	0
Brenthis_daphne	Nymphalidae	323	[illegible]	5	1	1	0	0	1.00	[illegible]	1.00	0.04	7.00	0.40	47	0	0	1	0	1	0	0	0	230	3.0	51	1	0	1	0	0	0	0

species	families	conservation range			OWS	OWS			GEN_Average				WSP_Female_average	WSP_Female						ELT_single					FM_Average						AFB_Honey		AFB_min flower
Brenthis_hecate	Nymphalidae	1905	5	1	0	0	0	1.00	1.0	1.0	0.0	40.8	0.40	0.80	0	1	0	0	1	0	0	25	2275	3.50	0	1	0	0	0	0	0	0	
Brenthis_ino	Nymphalidae	6995	5	1	1	0	0	1.00	1.0	1.0	0.0	37.8	0.20	0.41	1	1	0	0	1	1	0	0	2000	2.51	1	0	1	0	0	0	0		
Catopsilia_florella	Pieridae	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	50.0	1.00	NA	0	0	0	1	1	1	1	0	0	2000	11.2	NA	NA	NA	NA	NA	NA	NA	
Colias_palaeno	Pieridae	4175	5	1	1	0	0	1.00	1.0	1.0	0.0	47.0	1.00	0.70	0.71	1	0	0	1	0	0	0	2500	3.00	1	0	1	0	0	0	0		
Cyclyrius_webbianus	Lycaenidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	27.5	0.28	0.89	0	1	0	0	0	1	0	200	3300	NA	NA	1	0	0	0	0	0	0
Danaus_plexippus	Nymphalidae	38	NA	NA	1	1	1	3.00	3.0	3.0	0.0	70.2	0.30	0.35	0.40	0	1	0	0	NA	NA	NA	0	1100	10.35	1	0	0	0	0	0	0	
Erebia_eriphyle	Nymphalidae	345	5	1	1	0	0	0.50	0.5	0.5	0.0	34.0	0.50	0.00	0	1	0	0	NA	NA	NA	1200	1050	3.00	1	0	0	0	0	0	0		
Erebia_euryale	Nymphalidae	2035	5	1	1	0	0	0.75	0.5	1.0	0.5	44.0	0.09	0.60	0	1	0	0	1	0	0	600	1900	3.02	1	0	0	0	0	0	0		
Erebia_ligea	Nymphalidae	5645	5	1	1	0	0	0.75	0.5	1.0	0.5	41.0	1.00	0.18	0.31	1	0	0	1	0	0	0	2500	3.02	1	0	0	0	0	0	1		
Erebia_manto	Nymphalidae	895	5	1	1	0	0	0.50	0.5	0.5	0.0	39.0	1.00	0.30	0.16	0	1	0	0	1	0	0	900	1600	3.00	1	0	0	0	0	0	0	
Fabriciana_adippe	Nymphalidae	8885	5	1	1	0	0	1.00	1.0	1.0	0.0	53.9	0.50	0.00	0	1	0	0	1	0	0	0	2300	3.53	1	0	1	0	0	0	1		
Fabriciana_elisa	Nymphalidae	8	5	1	1	0	0	1.00	1.0	1.0	0.0	49.6	1.00	0.00	0	1	0	0	1	0	0	400	1600	3.00	1	0	0	0	0	0	0		

species	families	range	conservation	size	OWS	OWS_egg	OWS_larva	OWS_pupa	GEN_Average				WSP_Female_average	WSP_Female						ELT_single					FM_Average				AFB_honey	AFB_...	AFB_min	AFB_flower
Fabriciana_niobe	Nymphalidae	646	5	4	1	1	0	0	1.00	1.0	1.0	0.0	49.5	5	0.40	81	1	1	0	0	1	0	0	0	250	2.53	1	0	0	0	0	0	0
Favonius_quercus	Lycaenidae	777	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.6	0	0.40	80	0	0	0	1	1	0	0	0	200	5.02	0	0	0	1	0	1	1
Gegenes_nostrodamus	Hesperiidae	655	5	5	1	1	1	1	3.00	3.0	3.0	0.0	32.0	4	0.28	89	0	1	0	0	1	0	0	0	190	0.00	1	0	0	0	0	0	1
Gonepteryx_cleobule	Pieridae	NA	3	1	1	1	1	1	3.00	3.0	3.0	0.0	61.5	13	0.57	70	0	0	1	1	1	0	0	300	170	4.04	1	0	0	0	0	0	0
Hesperia_comma	Hesperiidae	807	5	5	1	1	0	0	1.00	1.0	1.0	0.0	31.6	0	0.33	33	1	1	0	0	1	0	0	0	220	3.53	1	0	0	0	0	0	0
Issoria_lathonia	Nymphalidae	976	5	5	1	1	1	1	2.00	1.0	3.0	2.0	42.5		0.40	81	1	1	0	0	1	0	0	0	275	7.06	1	0	0	0	0	0	1
Laeosopis_roboris	Lycaenidae	825	5	5	1	0	0	0	1.00	1.0	1.0	0.0	27.6	0	0.70	71	1	0	0	1	1	0	0	100	150	3.00	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	1	1	1	0	3.00	3.0	3.0	0.0	33.6	0	0.05	80	0	1	0	0	1	0	0	0	270	9.00	1	0	0	0	0	0	0
Lycaena_hippothoe	Lycaenidae	689	5	4	1	1	0	0	1.00	1.0	1.0	0.0	30.5	7	0.28	89	1	1	0	0	1	0	0	0	250	4.51	1	0	0	0	0	0	0
Lysandra_albicans	Lycaenidae	40	5	5	1	0	0	0	1.00	1.0	1.0	0.0	39.6	0	1.00	00	0	1	0	0	NA	NA	NA	500	100	3.00	1	0	0	0	0	0	1
Lysandra_coridon	Lycaenidae	575	4	4	1	0	0	0	1.50	1.0	2.0	1.0	33.6	0	1.00	01	0	0	0	1	0	0	100	240	3.00	1	0	0	0	0	0	1	1
Lysandra_hispana	Lycaenidae	50	5	5	1	0	0	0	2.00	2.0	2.0	0.0	34.0	4	1.00	00	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1

species	families	range	conservation	consrv_size	OWS	OWS_Sample	OWS_average	OWS_...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe...	...	...	...	...	...	...	ELT_single...	...	...	...	...	FM_Average	...	...	...	...	AFB_Honey...	AFB_...	AFB_mineral...	honi-...	flower
Muschampia_proto	Hesperiidae	88	5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.5	9	0.57	77	1	1	0	0	1	0	0	0	200	4.00	2	1	0	0	0	0	0	1
Par[illegible]phia	Nymphalidae	NA	2	1	1	1	1		3.00	3.0	3.0	0.0	45.5	3	0.10	02	1	1	0	0	1	0	0	0	100	12.0	0	0	0	1	1	1	0	0
Par[illegible]phibides	Nymphalidae	NA	5	1	1	1	1		3.00	3.0	3.0	0.0	37.5	1	0.10	02	1	1	0	0	1	0	0	0	200	12.0	0	0	0	1	1	1	0	0
Parnassius_apollo	Papilionidae	354	4	4	1	1	0	0	1.00	1.0	1.0	0.0	80.00		0.20	04	1	0	0	0	1	1	0	0	300	4.5	1	1	0	0	0	0	0	0
Parnassius_mnemosyne	Papilionidae	371	4	5	1	0	0	0	1.00	1.0	1.0	0.0	58.0	12	0.35	04	1	0	0	0	1	0	0	0	250	3.00	0	1	0	0	0	0	0	0
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	1.0	1.0	0.0	65.00		0.15	58	1	1	0	0	1	0	0	160	120	3.00	0	1	0	0	0	0	0	0
Pieris_cheiranthi	Pieridae	NA	2	1	1	1	1		3.00	3.0	3.0	0.0	62.5		0.28	89	1	1	1	0	0	1	1	200	1200	12.0		1	0	0	0	0	0	0
Plebejus_argus	Lycaenidae	991	5	5	1	0	0	0	1.50	1.0	2.0	1.0	22.5	9	0.06	69	1	1	0	0	1	0	0	0	240	4.00	0	1	0	0	0	0	1	1
Plebejus_argyrognomon	Lycaenidae	290	5	5	1	1	0	0	1.50	1.0	2.0	1.0	31.6	0	0.22	24	0	1	0	0	1	0	0	300	140	4.00	0	1	0	0	0	0	0	0
Plebejus_idas	Lycaenidae	774	5	5	1	0	0	0	1.50	1.0	2.0	1.0	24.5		0.04	41	0	1	0	0	1	0	0	100	230	5.00	0	1	0	0	0	0	0	0

species	families								GEN_Av				WSP_Female_aver		WSP_Fe						ELT_sin					FM_Aver				AFB_Av		AFB_min flower
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.00	1.0	1.0	0.0	32.0	4	0.447	1	0	0	0	1	0	0	600	180	2.00	1	0	0	0	0	0	1
Polyommatus_daphnis	Lycaenidae	305	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.6	0	0.129	1	1	0	0	1	0	0	200	180	3.00	1	0	0	0	0	0	1
Pyrgus_cirsii	Hesperiidae	94	3	3	1	1	0	0	1.00	1.0	1.0	0.0	27.0	2	0.408	1	1	0	0	1	0	0	0	100	3.02	1	0	0	0	0	0	1
Satyrium_acaciae	Lycaenidae	349	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	4	1.000	1	0	1	0	1	0	0	0	200	3.02	1	0	1	0	0	0	0
Satyrium_esculi	Lycaenidae	106	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.0	4	0.707	0	0	1	1	1	0	0	100	120	4.00	1	0	0	0	0	0	0
Satyrium_ilicis	Lycaenidae	586	5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.0	4	0.112	0	0	1	0	1	0	0	0	180	4.00	0	0	1	0	0	0	0
Satyrium_ledereri	Lycaenidae	1	NA	NA	1	0	0	0	1.00	1.0	1.0	0.0	29.0	4	0.577	0	0	1	0	1	0	0	600	190	3.53	1	0	0	0	0	0	0
Satyrium_pruni	Lycaenidae	408	5	5	1	0	0	0	1.00	1.0	1.0	0.0	31.5	9	0.134	0	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Satyrium_spini	Lycaenidae	483	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	4	0.167	0	0	1	0	1	1	0	0	200	3.51	1	0	1	1	0	0	0
Satyrium_w-album	Lycaenidae	553	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	4	0.065	0	0	1	1	1	0	0	0	170	3.00	1	0	0	1	0	0	0
Speyeria_aglaja	Nymphalidae	1132	5	5	1	1	0	0	1.00	1.0	1.0	0.0	51.5	9	0.500	1	1	0	0	1	0	0	0	250	3.53	1	0	0	0	0	1	1
Thecla_betulae	Lycaenidae	628	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.0	10	0.129	0	0	1	0	1	0	0	0	160	4.51	1	0	0	1	0	0	0
Thymelicus_lineola	Hesperiidae	926	5	5	1	0	0	0	1.00	1.0	1.0	0.0	25.5	7	0.067	0	1	0	0	0	1	1	0	250	3.53	1	0	0	0	0	0	1

species	family																															
Vanessa_cardui	Nymphalidae	NA	5		1	1	1	1	3.00	3.0	3.0	0.0	57.0	0.28	89	0	1	0	0	1	0	0	0	1500	12.0	1	0	0	0	0	0	0
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	0.28	9	NA	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA
Zizeeria_knysna	Lycaenidae	39	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	0.10	55	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1

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# same command, this time using the pipe
be %>%
  filter(OWS_egg == 1)
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species	family																															
Argynnis_paphia	Nymphalidae	1024	5		1	1	0	0	1.00	1.0	1.0	0.0	62.8	0.25	58	0	1	0	0	1	0	0	0	2300	4.02	1	0	1	1	0	0	1
Aricia_cramera	Lycaenidae	138	5	5	1	1	1	1	2.50	2.0	3.0	1.0	25.0	0.10	12	1	1	0	0	1	0	0	0	250	9.55	1	0	0	0	0	0	1
Azanus_ubaldus	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	12.5	0.50	77	0	0	1	0	1	1	0	0	1500	NA	0	0	1	0	0	0	0
Boloria_titania	Nymphalidae	141	5		1	1	0	0	1.00	1.0	1.0	0.0	39.5	0.50	00	0	1	0	0	1	0	0	100	2000	3.00	1	0	0	0	0	0	0
Brenthis_daphne	Nymphalidae	323	5		1	1	0	0	1.00	1.0	1.0	0.0	47.00	0.44	47	0	0	1	0	1	0	0	0	2300	3.051	1	0	1	0	0	0	0
Brenthis_hecate	Nymphalidae	190	5		1	0	0	0	1.00	1.0	1.0	0.0	40.8	0.40	08	0	1	0	0	1	0	0	25	2275	3.50	1	0	0	0	0	0	0

species	families								GEN_Av…				WSP_Female_aver…	WSP_Fe…						ELT_sin…					FM_Aver…				AFB_honey…			AFB_min… flower
Brenthis_ino	Nymphalidae	699	5	5	1	1	0	0	1.00	1.0	1.0	0.0	37.8	0.20	04	1	1	0	0	1	1	0	0	200	2.51	1	0	1	0	0	0	0
Catopsilia_florella	Pieridae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	50.10	NA	0	0	0	1	1	1	1	0	0	200	11.2	NA	NA	NA	NA	NA	NA	NA
Colias_palaeno	Pieridae	417	5	5	1	1	0	0	1.00	1.0	1.0	0.0	47.10	0.70	07	1	1	0	0	1	0	0	0	250	3.00	1	0	1	0	0	0	0
Cyclyrius_webbianus	Lycaenidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	27.5	0.28	89	0	1	0	0	0	1	0	200	330	NA NA	1	0	0	0	0	0	0
Danaus_plexippus	Nymphalidae	38	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	70.20	0.35	54	0	1	0	0	NA	NA	NA	0	110	10.3	1	0	0	0	0	0	0
Erebia_eriphyle	Nymphalidae	34	5	5	1	1	0	0	0.50	0.5	0.5	0.0	34.0	0.50	00	0	1	0	0	NA	NA	NA	120	105	3.00	1	0	0	0	0	0	0
Erebia_euryale	Nymphalidae	203	5	5	1	1	0	0	0.75	0.5	1.0	0.5	44.0	0.09	96	0	1	0	0	1	0	0	600	190	3.02	1	0	0	0	0	0	0
Erebia_ligea	Nymphalidae	564	5	5	1	1	0	0	0.75	0.5	1.0	0.5	41.10	0.18	83	1	1	0	0	1	0	0	0	250	3.02	1	0	0	0	0	0	1
Erebia_manto	Nymphalidae	89	5	5	1	1	0	0	0.50	0.5	0.5	0.0	39.10	0.30	16	0	1	0	0	1	0	0	900	160	3.00	1	0	0	0	0	0	0
Fabriciana_adippe	Nymphalidae	888	5	5	1	1	0	0	1.00	1.0	1.0	0.0	53.5	0.50	00	0	1	0	0	1	0	0	0	230	3.53	1	0	1	0	0	0	1
Fabriciana_elisa	Nymphalidae	8	5	5	1	1	0	0	1.00	1.0	1.0	0.0	49.6	1.00	00	0	1	0	0	1	0	0	400	160	3.00	1	0	0	0	0	0	0
Fabriciana_niobe	Nymphalidae	646	5	4	1	1	0	0	1.00	1.0	1.0	0.0	49.5	0.40	08	1	1	0	0	1	0	0	0	250	2.53	1	0	0	0	0	0	0

species	families	range	conservation		OWS	OWS_larva		GEN_Average				WSP_Female_average	WSP_Female				ELT_single					FM_Average					AFB_Aney		hori	AFB_min_flower
Favonius_quercus	Lycaenidae	777	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.6	0.408	0	0	0	1	1	0	0	0	200	5.02	0	0	0	1	0	1	1
Gegenes_nostrodamus	Hesperiidae	65	5	5	1	1	1	1	3.00	3.0	3.0	0.0	32.4	0.289	0	1	0	0	1	0	0	0	190	9.00	1	0	0	0	0	0	1
Gonepteryx_cleobule	Pieridae	NA	3	[illegible]	[illegible]	1	1	1	3.00	3.0	3.0	0.0	61.53	0.577	0	0	1	1	1	0	0	300	170	4.04	1	0	0	0	0	0	0
Hesperia_comma	Hesperiidae	807	5	5	1	1	0	0	1.00	1.0	1.0	0.0	31.6	0.333	1	1	0	0	1	0	0	0	220	3.53	1	0	0	0	0	0	0
Issoria_lathonia	Nymphalidae	976	5	5	1	1	1	1	2.00	1.0	3.0	2.0	42.5	0.408	1	1	0	0	1	0	0	0	275	7.06	1	0	0	0	0	0	1
Laeosopis_roboris	Lycaenidae	825	5	5	1	0	0	0	1.00	1.0	1.0	0.0	27.6	0.707	1	0	0	1	1	0	0	100	150	3.00	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	1	1	1	0	3.00	3.0	3.0	0.0	33.6	0.058	0	1	0	0	1	0	0	0	270	9.00	1	0	0	0	0	0	0
Lycaena_hippothoe	Lycaenidae	689	5	4	1	1	0	0	1.00	1.0	1.0	0.0	30.7	0.289	1	1	0	0	1	0	0	0	250	4.51	1	0	0	0	0	0	0
Lysandra_albicans	Lycaenidae	40	5	5	1	0	0	0	1.00	1.0	1.0	0.0	39.6	1.000	0	1	0	0	NA	NA	NA	500	100	3.00	1	0	0	0	0	0	1
Lysandra_coridon	Lycaenidae	575	4	4	1	0	0	0	1.50	1.0	2.0	1.0	33.6	1.000	1	0	0	0	1	0	0	100	240	3.00	1	0	0	0	0	1	1
Lysandra_hispana	Lycaenidae	50	5	5	1	0	0	0	2.00	2.0	2.0	0.0	34.0	1.000	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1
Muschampia_proto	Hesperiidae	88	5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.5	0.577	1	1	0	0	1	0	0	0	200	4.02	1	0	0	0	0	0	1

species	family	[illegible]	con-serv-range	conserv-size	OWS_[illegible]	OWS_larva	OWS_egg	OWS_[illegible]	GEN_Average	GEN_[illegible]	GEN_[illegible]	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	[illegible]	AFB_honey	AFB_[illegible]	AFB_min[illegible]	[illegible]flower
Pararge_xiphia	Nymphalidae	NA	2	[illegible]	1	1	1	1	3.00	3.0	3.0	0.0	45.5	3	0.102	1	1	0	0	1	0	0	0	100	12.0	0	0	0	1	1	1	0	0	
Pararge_xiphioides	Nymphalidae	NA	5	[illegible]	1	1	1	1	3.00	3.0	3.0	0.0	37.5	1	0.102	1	1	0	0	1	0	0	0	200	12.0	0	0	0	1	1	1	0	0	
Parnassius_apollo	Papilionidae	354	4	4	1	1	0	0	1.00	1.0	1.0	0.0	80.0	30	0.204	1	0	0	0	1	1	0	0	300	4.05	1	1	0	0	0	0	0	0	
Parnassius_mnemosyne	Papilionidae	371	4	5	1	0	0	0	1.00	1.0	1.0	0.0	58.0	12	0.354	1	0	0	0	1	0	0	0	250	3.00		1	0	0	0	0	0	0	
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	1.0	1.0	0.0	65.0	30	0.158	1	1	0	0	1	0	0	160	120	3.00		1	0	0	0	0	0	0	
Pieris_cheiranthi	Pieridae	NA	2	[illegible]	1	1	1	1	3.00	3.0	3.0	0.0	62.5		0.289	1	1	1	0	0	1	1	200	1200	12.0		1	0	0	0	0	0	0	
Plebejus_argus	Lycaenidae	991	5	5	1	0	0	0	1.50	1.0	2.0	1.0	22.5	9	0.069	1	1	0	0	1	0	0	0	240	4.00		1	0	0	0	0	1	1	
Plebejus_argyrognomon	Lycaenidae	290	5	5	1	1	0	0	1.50	1.0	2.0	1.0	31.0	6	0.224	0	1	0	0	1	0	0	300	140	4.00		1	0	0	0	0	0	0	
Plebejus_idas	Lycaenidae	774	5	5	1	0	0	0	1.50	1.0	2.0	1.0	24.5		0.041	0	1	0	0	1	0	0	100	230	5.00		1	0	0	0	0	0	0	
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.00	1.0	1.0	0.0	32.0	4	0.447	1	0	0	0	1	0	0	600	180	2.00		1	0	0	0	0	0	1	

species	families	range	conservation		OWS				GEN_Av-				WSP_Female_average	WSP_Fe-				ELT_sin-					FM_Average				AFB_honey-		AFB_min-	flower
Polyommatus_daphnis	Lycaenidae	305	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.6	0.1291	1	0	0	1	0	0	200	180	3.00	1	0	0	0	0	0	1
Pyrgus_cirsii	Hesperiidae	94	3	3	1	1	0	0	1.00	1.0	1.0	0.0	27.2	0.4081	1	0	0	1	0	0	0	100	3.02	1	0	0	0	0	0	1
Satyrium_acaciae	Lycaenidae	349	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	1.0001	0	1	0	1	0	0	0	200	3.02	1	0	1	0	0	0	0
Satyrium_esculi	Lycaenidae	106	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.0	0.7070	0	1	1	1	0	0	100	120	4.00	1	0	0	0	0	0	0
Satyrium_ilicis	Lycaenidae	586	5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.0	0.1120	0	1	0	1	0	0	0	180	4.00	0	0	1	0	0	0	0
Satyrium_ledereri	Lycaenidae	1	NA	NA	1	0	0	0	1.00	1.0	1.0	0.0	29.0	0.5770	0	1	0	1	0	0	600	190	3.53	1	0	0	0	0	0	0
Satyrium_pruni	Lycaenidae	408	5	5	1	0	0	0	1.00	1.0	1.0	0.0	31.5	0.1340	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Satyrium_spini	Lycaenidae	483	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	0.1670	0	1	0	1	1	0	0	200	3.51	1	0	1	1	0	0	0
Satyrium_w-album	Lycaenidae	553	5	5	1	0	0	0	1.00	1.0	1.0	0.0	30.0	0.0650	0	1	1	1	0	0	0	170	3.00	1	0	0	1	0	0	0
Speyeria_aglaja	Nymphalidae	1132	5	5	1	1	0	0	1.00	1.0	1.0	0.0	51.5	0.5001	1	0	0	1	0	0	0	250	3.53	1	0	0	0	0	1	1
Thecla_betulae	Lycaenidae	628	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.00	0.1290	0	1	0	1	0	0	0	160	4.51	1	0	0	1	0	0	0
Thymelicus_lineola	Hesperiidae	926	5	5	1	0	0	0	1.00	1.0	1.0	0.0	25.7	0.0670	1	0	0	0	1	1	0	250	3.53	1	0	0	0	0	0	1
Vanessa_cardui	Nymphalidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	57.6	0.2890	1	0	0	1	0	0	0	1500	12.0	1	0	0	0	0	0	0
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	0.289	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA

species	family	[illegible]	con-serv…	con…	OWS_…	OWS_…	OWS_…	OWS_…	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe…	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin…	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honeydew	[illegible]	AFB_an…	AFB_min…	AFB_flower
Zizeeria_karsandra	Lycaenidae	39	NA	NA	1	1	1	1	3.00	3.00	3.00	0.02	22.0	4	0.10	15	NA	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1

Note how in the second command, the output of `be` (which is our data frame) gets passed on to the `filter()` command. There, you don't have to specify the name of the data frame again. The result of this can be piped further to other commands:

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

species	family	[illegible]	con-serv…	con…	OWS_…	OWS_…	OWS_…	OWS_…	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe…	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin…	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honeydew	[illegible]	AFB_an…	AFB_min…	AFB_flower
Pararge_xiphia	Nymphalidae	[illegible]	NA	2	1	1	1	1	3	3	3	0	45.5	3	0.10	0.21	1	1	0	0	1	0	0	0	1000	12	0	0	0	1	1	1	0	0
Pararge_xiphioides	Nymphalidae	[illegible]	NA	5	1	1	1	1	3	3	3	0	37.5	1	0.10	0.21	1	1	0	0	1	0	0	0	2000	12	0	0	0	1	1	1	0	0

```
# 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)
```

Note how easy this command is to read (you could write it in a single line, but it's much easier to follow with line breaks)! The usefulness of the pipe will become more obvious when we combine multiple different commands. In all the following examples, I will always use the pipe.

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)
```

species	family	conserv.range	conserv.eu	[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	GEN_Av-er-age	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Fe-male_av-er-age	WSP_Fe-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Av-er-[illegible]	[illegible]	[illegible]	[illegible]	AFB_hon-ey-[illegible]	AFB_[illegible]	AFB_an-i-[illegible]	AFB_min-[illegible]_flower
Tomares_nogelii	Lycaenidae	2	3	0	NA	NA	NA	NA	NA	1.0	1.0	1.0	0.0	32.5	1.0	NA	NA	NA	NA	NA	NA	NA	NA	0	2300	3.0	51	NA	NA	NA	NA	NA
Colias_myrmidone	Pieridae	94	2	1	0	1	0	0	2.5	2.0	3.0	1.0	47.0	0.30	16	0	1	0	0	1	0	0	0	500	5.5	1	1	0	0	0	0	0
Phengaris_arion	Lycaenidae	522	2	2	0	1	0	0	1.0	1.0	1.0	0.0	36.0	0.50	01	1	0	0	1	0	0	0	2400	0.00	1	0	0	0	0	0	0	
Leptidea_morsei	Pieridae	49	4	2	0	0	1	0	2.0	2.0	2.0	0.0	41.5	0.57	70	1	0	0	1	0	0	0	1400	5.00	1	0	0	0	0	0	1	
Boloria_improba	Nymphalidae	6	2	2	0	1	0	0	1.0	1.0	1.0	0.0	32.5	0.50	00	1	0	0	NA	NA	NA	600	450	2.02	1	0	0	0	0	0	0	
Turanana_taygetica	Lycaenidae	3	2	2	0	0	1	0	1.5	1.0	2.0	1.0	21.0	0.57	NA	NA	NA	NA	NA	NA	NA	1500	800	4.00	1	0	0	0	0	0	1	
Agriades_zullichi	Lycaenidae	2	2	2	0	1	0	0	1.0	1.0	1.0	0.0	23.5	1.00	01	1	0	0	1	0	0	2400	600	3.00	1	0	0	0	0	0	0	
Polyommatus_humedasae	Lycaenidae	2	2	2	0	1	0	0	1.0	1.0	1.0	0.0	30.5	1.00	NA	NA	NA	NA	NA	NA	NA	1000	100	2.00	1	0	0	0	0	0	0	
Gonepteryx_maderensis	Pieridae	NA	2	0	0	0	1	3.0	3.0	3.0	0.0	61.5	13	1.00	NA	NA	NA	NA	NA	NA	NA	500	1000	9.06	0	0	1	0	0	0	0	

species	families	range	conservation		OWS	OWS_			GEN_Average				WSP_Female_average	WSP_Fe-						ELT_sin-				FM_Average				AFB_		AFB_min-	flower
Pararge_xiphia	Nymphalidae	NA	2	3	1	1	1	1	3.0	3.0	3.0	0.0	45.57	0.102	1	1	0	0	1	0	0	0	1000	12.0	0	0	1	1	1	0	0
Pieris_cheiranthi	Pieridae	NA	2	2	1	1	1	1	3.0	3.0	3.0	0.0	62.5	0.289	1	1	1	0	0	1	1	200	1200	12.0	1	0	0	0	0	0	0
Nymphalis_polychloros	Nymphalidae	845	3	1	0	0	0	1	1.5	1.0	2.0	1.0	62.02	0.136	0	0	1	1	0	0	1	0	2600	0.57	1	0	1	0	1	1	1
Lopinga_achine	Nymphalidae	275	3	3	0	1	0	0	1.0	1.0	1.0	0.0	44.8	0.086	1	1	0	0	1	0	0	100	1400	2.51	1	0	0	1	1	0	1
Phengaris_teleius	Lycaenidae	252	3	3	0	1	0	0	1.0	1.0	1.0	0.0	34.04	1.000	1	1	0	0	1	0	0	100	1500	3.00	1	0	0	0	0	0	0
Coenonympha_hero	Nymphalidae	173	3	3	0	1	0	0	1.0	1.0	1.0	0.0	30.04	0.154	0	1	0	0	1	0	0	0	800	3.53	1	0	1	0	0	0	0
Pyrgus_cirsii	Hesperiidae	94	3	3	1	1	0	0	1.0	1.0	1.0	0.0	27.02	0.408	1	1	0	0	1	0	0	0	1000	3.02	1	0	0	0	0	0	1
Colias_chrysotheme	Pieridae	36	3	3	0	1	0	0	2.5	2.0	3.0	1.0	44.8	0.408	1	1	0	0	1	0	0	0	1500	7.00	1	0	0	0	0	0	0
Boloria_polaris	Nymphalidae	18	3	3	0	1	0	0	1.0	1.0	1.0	0.0	41.5	0.24	NA	NA	NA	NA	1	0	0	100	1300	2.53	NA	NA	NA	NA	NA	NA	NA
Erebia_sudetica	Nymphalidae	13	3	3	0	1	0	0	1.0	1.0	1.0	0.0	28.53	1.000	NA	NA	NA	NA	1	0	0	600	1600	2.51	1	0	0	0	0	0	0
Polyommatus_orphicus	Lycaenidae	9	3	3	NA	NA	NA	NA	1.0	1.0	1.0	0.0	33.60	0.577	NA	NA	NA	NA	NA	NA	NA	400	1600	NA	NA	NA	NA	NA	NA	NA	NA
Euchloe_bazae	Pieridae	5	3	3	0	0	1	0	1.5	1.0	2.0	1.0	34.04	0.500	1	0	0	0	1	1	0	0	800	4.00	1	0	0	0	0	0	0

species	families	range	conservation		OWS	OWS_			GEN_Av				WSP_Female_aver		WSP_Fe						ELT_sin						FM_Aver		AFB_honey		AFB_ani	AFB_min		flower
Polyommatus_golgus	Lycaenidae	3	3	3	0	1	0	0	1.00	1.0	1.00	0.0	28.0	4	1.00	0	0	1	1	0	0	1	0	0	190	110	2.00	1	0	0	0	0	0	0
Polyommatus_violetae	Lycaenidae	3	3	3	0	1	0	0	1.00	1.0	1.00	0.0	31.0	6	1.00	0	0	0	1	0	0	NA	NA	NA	1200	600	2.00	1	0	0	1	0	0	1
Erebia_christi	Nymphalidae	1	3	3	0	1	0	0	0.50	0.5	0.50	0.0	38.0	4	1.00	NA	NA	NA	NA	NA	NA	NA	NA	NA	1300	800	2.51	1	0	0	0	0	0	1
Pseudochazara_orestes	Nymphalidae	1	3	3	NA	NA	NA	NA	1.00	1.0	1.00	0.0	53.5	3	0.28	89	NA	NA	NA	NA	NA	NA	NA	NA	300	160	3.02	1	0	0	0	0	0	0
Gonepteryx_cleobule	Pieridae	NA	3	3	1		1	1	3.00	3.0	3.00	0.0	61.5	13	0.50	77	0	0	1	1	1	0	0	300	170	4.00	4	1	0	0	0	0	0	0
Hipparchia_bacchus	Nymphalidae	NA	3	3	0	1	0	0	1.00	1.0	1.00	0.0	59.6	0	0.28	89	NA	NA	NA	NA	NA	NA	NA	NA	300	120	2.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_tilosi	Nymphalidae	NA	3	3	0	1	0	0	1.00	1.0	1.00	0.0	59.6	0	0.28	89	NA	NA	NA	NA	NA	NA	NA	NA	400	900	3.00	NA	NA	NA	NA	NA	NA	NA
Pseudochazara_amymone	Nymphalidae	NA	3	3	0	1	0	0	1.00	1.0	1.00	0.0	53.2	0	0.28	89	NA	NA	NA	NA	NA	NA	NA	NA	500	100	2.51	1	0	0	0	0	0	1
Lycaena_hippothoe	Lycaenidae	689	5	4	1	1	0	0	1.00	1.0	1.00	0.0	30.7	5	0.28	89	1	1	0	0	1	0	0	0	250	40	0.51	1	0	0	0	0	0	0
Fabriciana_niobe	Nymphalidae	646	5	4	1	1	0	0	1.00	1.0	1.00	0.0	49.9	5	0.40	08	1	1	0	0	1	0	0	0	250	2	0.53	1	0	0	0	0	0	0

species	family																																	
Lysandra_coridon	Lycaenidae	575	4	4	1	0	0	0	1.5	10.0	2.0	1.0	33.6	0	1.00	0.00	1	0	0	0	1	0	0	100	240	3.000	1	0	0	0	0	1	1
Limenitis_populi	Nymphalidae	529	5	4	0	1	0	0	1.0	10.0	1.0	0.0	77.5	11	0.50	0.77	0	0	0	1	1	0	0	100	155	2.051	0	0	0	0	1	1	0
Lycaena_alciphron	Lycaenidae	519	5	4	0	1	0	0	1.0	10.0	1.0	0.0	34.0	0	0.50	0.77	1	1	0	0	1	0	0	0	250	4.000	1	0	0	0	0	0	0
Thymelicus_acteon	Hesperiidae	496	4	4	0	1	0	0	1.5	10.0	2.0	1.0	24.0	0	0.10	0.18	0	1	0	0	0	1	0	0	250	4.053	1	0	0	0	0	0	0
Melitaea_diamina	Nymphalidae	465	5	4	0	1	0	0	1.5	10.0	2.0	1.0	35.5	9	0.10	0.26	1	1	0	0	0	0	1	100	210	3.055	1	0	0	0	0	0	1
Hipparchia_statilinus	Nymphalidae	360	4	4	0	1	0	0	1.0	10.0	1.0	0.0	45.0	2	0.10	0.23	1	1	0	0	1	0	0	0	250	4.004	1	0	1	0	0	1	1
Parnassius_apollo	Papilionidae	354	4	4	1	1	0	0	1.0	10.0	1.0	0.0	80.0	30	0.20	0.04	1	0	0	0	1	1	0	0	300	4.051	1	0	0	0	0	0	0
Phengaris_alcon	Lycaenidae	354	5	4	0	1	0	0	1.0	10.0	1.0	0.0	36.0	0	0.51	0.77	1	1	0	0	1	1	0	100	120	3.000	1	0	0	0	0	0	0
Chazara_briseis	Nymphalidae	353	4	4	0	1	0	0	1.0	10.0	1.0	0.0	55.0	26	0.30	0.33	1	1	0	0	1	1	0	0	250	4.004	1	0	0	0	0	1	1
Polyommatus_dorylas	Lycaenidae	330	4	4	0	1	0	0	1.5	10.0	2.0	1.0	32.0	0	0.20	0.04	1	1	0	0	1	0	0	100	220	4.000	1	0	0	0	0	0	0

species	families	range	conservation			OWS	OWS_lar...		GEN_Av...				WSP_Female_average	WSP_Fe...					ELT_sin...						FM_Average				AFB_...			AFB_min-flower
Pyrgus_serratulae	Hesperiidae	318	5	4	0	1	0	0	1.00	1.0	1.0	0.0	28.8	0.30	16	1	1	0	0	1	0	0	0	280	3.02	1	0	0	0	0	0	0
Hipparchia_fagi	Nymphalidae	309	4	4	0	1	0	0	1.00	1.0	1.0	0.0	66.8	0.25	50	1	1	0	0	1	0	0	0	240	4.53	1	0	1	0	1	0	0
Melitaea_trivia	Nymphalidae	260	5	4	0	1	0	0	2.00	1.0	3.0	2.0	33.00	0.44	47	0	1	0	0	0	0	1	0	240	5.06	1	0	0	0	0	0	1
Scolitantides_orion	Lycaenidae	260	5	4	0	0	1	0	1.50	1.0	2.0	1.0	27.5	0.33	33	0	1	0	0	1	0	0	0	150	5.00	1	0	0	0	0	0	0
Hipparchia_hermione	Nymphalidae	237	4	4	0	1	0	0	1.00	1.0	1.0	0.0	61.00	0.40	08	1	1	0	0	1	0	0	0	190	2.02	1	0	1	0	0	0	0
Pseudophilotes_vicrama	Lycaenidae	212	4	4	0	1	1	0	1.50	1.0	2.0	1.0	23.6	0.06	69	0	1	0	0	NA	NA	NA	0	200	5.00	1	0	0	0	0	0	0
Phengaris_nausithous	Lycaenidae	188	4	4	0	1	0	0	1.00	1.0	1.0	0.0	35.2	1.00	00	1	1	0	0	1	0	0	100	150	3.00	1	0	0	0	0	0	0
Polyommatus_damon	Lycaenidae	163	4	4	1	1	0	0	1.00	1.0	1.0	0.0	32.4	0.44	47	1	0	0	0	1	0	0	600	180	2.00	1	0	0	0	0	0	1
Carcharodus_lavatherae	Hesperiidae	146	4	4	0	1	0	0	1.00	1.0	1.0	0.0	31.6	0.40	08	1	1	0	0	1	0	0	0	160	4.02	1	0	0	0	0	0	1
Nymphalis_xanthomelas	Nymphalidae	115	[illegible]	4	0	0	0	1	1.00	1.0	1.0	0.0	62.02	0.70	07	0	0	0	1	0	0	1	0	200	4.53	0	0	0	0	1	0	0
Iolana_iolas	Lycaenidae	102	4	4	0	0	1	0	1.50	0.5	1.5	0.0	39.6	0.70	07	1	1	0	0	1	0	0	100	170	4.00	1	0	0	0	0	0	1

species	families		con- serv-						GEN_Av-					WSP_Female_av-	WSP_Fe-					ELT_sin-					FM_Aver-			AFB_Av-	hon-ey-	AFB_an-	AFB_min-	flower
Argynnis_laodice	Nymphalidae	100	5	4	0	1	0	0	1.00	1.0	1.0	0.0	55.0	1.00	0.707	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.000	0	0	1	0	0	0	1
Melitaea_britomartis	Nymphalidae	99	4	4	0	1	0	0	1.50	1.0	2.0	1.0	33.6		0.224	0	1	0	0	0	0	1	200	700	3.02	1	0	0	0	0	0	0
Polyommatus_eros	Lycaenidae	88	4	4	0	1	0	0	1.00	1.0	1.0	0.0	31.0	1.00	0.408	0	1	0	0	1	0	0	600	210	3.000	1	0	0	0	0	0	1
Colias_phicomone	Pieridae	83	4	4	0	1	0	0	1.25	1.0	1.5	0.5	45.0	1.00	0.169	1	0	0	0	1	0	0	900	160	3.051	1	0	0	0	0	0	0
Zerynthia_cerisy	Papilionidae	61	4	4	0	0	1	0	1.00	1.0	1.0	0.0	57.0	1.00	0.354	0	1	0	0	0	1	0	0	170	5.000	1	0	0	0	0	0	0
Polyommatus_ripartii	Lycaenidae	59	5	4	0	1	0	0	1.00	1.0	1.0	0.0	31.6		0.447	1	1	0	0	1	0	0	100	190	4.000	1	0	0	0	0	0	0
Oeneis_norna	Nymphalidae	54	[illegible]	4	0	1	0	0	0.50	0.5	0.5	0.0	47.0	1.04	0.236	0	1	0	0	1	0	0	200	700	2.000	NA	NA	NA	NA	NA	NA	NA
Parnassius_phoebus	Papilionidae	48	4	4	1	1	0	0	1.00	1.0	1.0	0.0	65.0	3.00	0.158	1	1	0	0	1	0	0	1600	120	3.000	1	0	0	0	0	0	0
Euphydryas_desfontainii	Nymphalidae	41	4	4	0	1	0	0	1.00	1.0	1.0	0.0	46.0	1.2	1.000	0	1	0	0	0	0	1	0	280	3.000	1	0	0	0	0	0	0
Pseudophilotes_panoptes	Lycaenidae	41	4	4	0	0	1	0	2.00	2.0	2.0	0.0	21.5		0.50	NA	NA	NA	NA	NA	NA	NA	200	170	6.000	1	0	0	0	0	0	1

species	families													WSP_Female_average_WSP_Fe-									ELT_sin-		FM_Average					AFB_honey	AFB_ani	AFB_min-flower
Zegris_eupheme	Pieridae	36	4	4	0	0	1	0	1.00	1.0	1.0	0.0	48.5	0.192	0	1	0	0	1	0	0	500	900	4.00	1	0	0	0	0	0	0
Polyommatus_nivescens	Lycaenidae	26	4	4	0	1	0	0	1.00	1.0	1.0	0.0	33.6	1.000	1	1	0	0	1	0	0	1000	1200	4.00	1	0	0	0	0	0	1
Colias_hecla	Pieridae	24	4	4	0	1	1	0	1.00	1.0	1.0	0.0	43.8	0.177	1	0	0	0	1	1	0	0	900	3.00	1	0	0	0	0	0	0
Erebia_epistygne	Nymphalidae	24	4	4	0	1	0	0	1.00	1.0	1.0	0.0	47.6	1.000	NA	NA	NA	NA	NA	NA	NA	400	1150	5.00	1	0	0	0	0	0	0
Euphydryas_iduna	Nymphalidae	24	4	4	0	1	0	0	1.00	1.0	1.0	0.0	41.8	0.316	0	1	0	0	0	1	0	300	400	2.00	NA	NA	NA	NA	NA	NA	NA
Boloria_chariclea	Nymphalidae	22	4	4	NA	NA	NA	NA	1.00	1.0	1.0	0.0	38.8	0.354	NA	NA	NA	NA	NA	NA	NA	100	1300	1.51	1	0	0	0	0	0	0
Erebia_claudina	Nymphalidae	8	4	4	0	1	0	0	0.75	0.5	1.0	0.5	35.2	0.500	0	1	0	0	NA	NA	NA	1400	900	3.02	1	0	0	0	0	0	0
Muschampia_cribrellum	Hesperiidae	17	4	4	0	1	0	0	1.00	1.0	1.0	0.0	29.6	0.289	NA	NA	NA	NA	NA	NA	NA	0	1000	3.00	1	0	0	0	0	0	1
Erebia_flavofasciata	Nymphalidae	5	4	4	0	1	0	0	0.50	0.5	0.5	0.0	35.2	1.000	NA	NA	NA	NA	1	0	0	1800	800	3.00	1	0	0	0	0	0	0
Agriades_dardanus	Lycaenidae	2	4	4	NA	NA	NA	NA	1.00	1.0	1.0	0.0	25.6	0.577	NA	NA	NA	NA	NA	NA	NA	800	3400	4.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_leighebi	Nymphalidae	1	4	4	0	1	0	0	1.00	1.0	1.0	0.0	52.4	0.289	NA	NA	NA	NA	NA	NA	NA	0	500	4.00	NA	NA	NA	NA	NA	NA	NA

species	families	range	con-serv-	con-	OWS	OWS	OWS	OWS	GEN_Av-er-age	GEN	GEN	GEN	WSP_Fe-male_av-er-age	WSP_Fe-	WSP					ELT_sin-					FM_Av-er-age	AFB_hon-ey-	AFB_an-i-	AFB	AFB	AFB	AFB	AFB_min-flower
Hipparchia_sbordonii	Nymphalidae	NA	4		0	1	0	0	1.00	1.0	1.0	0.0	52.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	0	200	2.00	NA	NA	NA	NA	NA	NA	NA
Maniola_halicarnassus	Nymphalidae	NA	4		0	1	0	0	1.00	1.0	1.0	0.0	44.5		0.289	1	1	0	0	1	1	0	0	450	3.04	1	0	0	0	0	0	0
Polyommatus_nephohiptamenos	Lycaenidae	NA	4	4	NA	NA	NA	NA	1.00	1.0	1.0	0.0	30.5		1.000	NA	NA	NA	NA	NA	NA	NA	NA	12800	2.00	NA	NA	NA	NA	NA	NA	NA
Polyommatus_icarus	Lycaenidae	1476		5	0	1	0	0	2.50	1.0	4.0	3.0	28.5	11	0.144	1	1	0	0	1	0	0	0	290	7.00	1	0	0	0	0	1	1
Pieris_napi	Pieridae	1405		5	0	0	1	0	2.00	1.0	3.0	2.0	40.0	16	0.141	1	1	0	0	1	0	0	0	250	5.57	1	0	1	0	0	0	0
Vanessa_cardui	Nymphalidae	1373		5	0	0	0	1	2.00	1.0	3.0	2.0	54.0	16	0.083	0	1	0	0	1	0	0	0	300	8.08	1	0	1	1	0	0	0
Coenonympha_pamphilus	Nymphalidae	1371		5	0	1	0	0	2.00	1.0	3.0	2.0	28.0	10	0.096	0	1	0	0	1	0	0	0	270	7.06	1	0	0	0	0	0	0
Pieris_rapae	Pieridae	1363		5	0	0	1	0	2.00	1.0	3.0	2.0	44.5	11	0.181	1	1	0	0	0	1	0	0	300	9.51	1	0	0	0	0	0	1
Pieris_brassicae	Pieridae	1353		5	0	0	1	0	2.50	2.0	3.0	1.0	57.0	12	0.151	1	1	0	0	0	1	1	0	250	7.06	1	0	1	0	0	0	0
Vanessa_atalanta	Nymphalidae	1343		5	0	0	0	1	2.00	1.0	3.0	2.0	59.5	13	0.316	0	1	0	0	1	0	0	0	250	8.57	1	0	1	1	1	1	1
Lycaena_phlaeas	Lycaenidae	1340		5	0	1	0	0	2.00	1.0	3.0	2.0	26.5	11	0.333	1	0	0	0	1	0	0	0	240	9.51	1	0	1	0	0	1	1
Maniola_jurtina	Nymphalidae	1289		5	0	1	0	0	1.00	1.0	1.0	0.0	41.5	9	0.289	1	1	0	0	0	1	0	0	250	5.06	1	0	1	0	0	0	0

species	families	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aglais_urticae	Nymphalidae	1271	5	0	0	0	1	2.00	1.0	3.0	2.0	48.0	10	0.7070	1	0	0	0	0	1	0	300	7	0.53	1	0	1	0	0	1	1
Anthocharis_cardamines	Pieridae	1245	5	0	0	1	0	1.00	1.0	1.0	0.0	40.5	15	0.1010	1	0	0	1	0	0	0	230	4	0.02	1	0	0	0	0	0	0
Papilio_machaon	Papilionidae	1224	5	0	0	1	0	2.00	1.0	3.0	2.0	75.0	30	0.0530	1	0	0	1	0	0	0	300	6	0.55	1	0	1	0	0	0	0
Callophrys_rubi	Lycaenidae	1192	5	0	0	1	0	1.25	1.0	1.5	0.5	23.0	6	0.0331	1	1	0	1	0	0	0	230	6	0.02	1	0	1	1	0	0	0
Celastrina_argiolus	Lycaenidae	1190	5	0	0	1	0	1.75	1.0	2.5	1.5	27.0	10	0.0200	0	1	1	1	0	0	0	190	7	0.00	1	0	1	1	0	0	0
Pararge_aegeria	Nymphalidae	1178	5	0	1	1	0	2.00	1.0	3.0	2.0	40.0	4	0.1540	1	0	0	1	0	0	0	250	7	0.010	1	0	1	0	1	0	0
Gonepteryx_rhamni	Pieridae	1177	5	0	0	0	1	1.00	1.0	1.0	0.0	58.0	12	0.2180	0	1	0	1	0	0	0	200	8	0.02	1	0	1	0	0	0	0
Aglais_io	Nymphalidae	1136	5	0	0	0	1	2.00	1.0	3.0	2.0	53.5	17	0.2360	1	0	0	0	0	1	0	250	7	0.53	1	0	1	0	0	1	1
Speyeria_aglaja	Nymphalidae	1132	5	1	1	0	0	1.00	1.0	1.0	0.0	51.5	9	0.5001	1	0	0	1	0	0	0	250	3	0.53	1	0	0	0	0	1	1
Polygonia_c-album	Nymphalidae	1098	5	0	0	0	1	2.00	1.0	3.0	2.0	46.0	12	0.0500	1	1	1	1	0	0	0	270	6	0.57	1	0	1	1	1	1	1
Leptidea_sinapis	Pieridae	1089	5	0	0	1	0	2.00	1.0	3.0	2.0	38.0	10	0.1440	1	0	0	1	0	0	0	200	6	0.04	1	0	0	0	0	0	1
Ochlodes_sylvanus	Hesperiidae	1058	5	0	1	0	0	1.50	1.0	2.0	1.0	30.0	6	0.0830	1	0	0	1	0	0	0	230	4	0.00	1	0	0	0	0	1	1

species	families		conservation		OWS	OWS_egg		GEN_Av				WSP_Female_average	WSP_Fe					ELT_sin					FM_Average				AFB_honey		AFB_an	AFB_min	flower
Lasiommata_megera	Nymphalidae	1053	5	0	1	0	0	2.0	0.03	3.0	2.0	42.5	0.1200	0	1	0	0	1	1	0	0	2500.57	1	0	1	0	0	0	0		
Colias_crocea	Pieridae	1028	5	0	1	1	0	3.0	0.03	3.0	0.0	48.0	0.0410	0	1	0	0	1	0	0	0	3007.04	1	0	0	0	0	0	1		
Argynnis_paphia	Nymphalidae	1024	5	1	1	0	0	1.0	0.01	1.0	0.0	62.8	0.2580	0	1	0	0	1	0	0	0	2304.02	1	0	1	1	0	0	1		
Melitaea_athalia	Nymphalidae	1051	5	0	1	0	0	1.5	0.02	2.0	2.0	35.5	0.1071	1	1	0	0	0	0	1	0	2303.53	1	0	0	0	0	1	0		
Aphantopus_hyperantus	Nymphalidae	1002	5	0	1	0	0	1.0	0.01	1.0	0.0	38.5	0.0631	1	1	0	0	1	1	0	0	2003.00	1	0	1	0	0	0	0		
Boloria_selene	Nymphalidae	998	5	0	1	1	0	1.5	0.02	2.0	1.0	36.5	0.5770	0	1	0	0	1	0	0	0	2203.53	1	0	0	0	0	0	1		
Plebejus_argus	Lycaenidae	991	5	1	0	0	0	1.5	0.02	2.0	1.0	22.5	0.0691	1	1	0	0	1	0	0	0	2404.00	1	0	0	0	0	1	1		
Issoria_lathonia	Nymphalidae	976	5	1	1	1	1	2.0	0.03	3.0	2.0	42.5	0.4081	1	1	0	0	1	0	0	0	2757.06	1	0	0	0	0	0	1		
Boloria_euphrosyne	Nymphalidae	963	5	0	1	0	0	1.5	0.02	2.0	1.0	36.00	0.5770	0	1	0	0	1	0	0	0	2304.04	1	0	0	0	0	0	0		
Pyrgus_malvae	Hesperiidae	959	5	0	0	1	0	1.5	0.02	2.0	1.0	23.0	0.1920	0	1	0	0	1	0	0	0	2505.04	1	0	0	0	0	0	0		

species	families			OWS_egg	OWS_larva	OWS_pupa	OWS_adult	GEN_Average				WSP_Female_average	WSP_Female_						ELT_sin-					FM_Average				AFB_honey-		AFB_ani-	AFB_min-flower
Cyaniris_semiargus	Lycaenidae	930.5	5	0	1	0	0	1.25	1.0	1.5	0.5	29.0	8	0.169	0	1	0	0	1	0	0	0	2400	6.00	1	0	0	0	0	0	0
Thymelicus_lineola	Hesperiidae	926.5	5	1	0	0	0	1.00	1.0	1.0	0.0	25.5	7	0.067	0	1	0	0	0	1	1	0	2500	3.53	1	0	0	0	0	0	1
Pontia_daplidice	Pieridae	921.5	5	0	0	1	0	3.00	3.0	3.0	0.0	41.5	7	0.061	0	1	0	0	1	1	0	0	3000	5.53	1	0	0	0	0	0	0
Nymphalis_antiopa	Nymphalidae	910.5	5	0	0	0	1	1.25	1.0	1.5	0.5	67.5	17	0.192	0	0	1	1	0	0	1	0	2000	5.57	1	0	1	1	1	1	1
Aporia_crataegi	Pieridae	894.5	5	0	1	0	0	1.00	1.0	1.0	0.0	62.5	11	0.082	0	1	1	0	0	0	1	0	2600	3.51	1	1	0	1	0	0	1
Fabriciana_adippe	Nymphalidae	888.5	5	1	1	0	0	1.00	1.0	1.0	0.0	53.5	9	0.500	0	1	0	0	1	0	0	0	2300	3.53	1	0	1	0	0	0	1
Lasiommata_maera	Nymphalidae	888.5	5	0	1	0	0	2.00	1.0	3.0	2.0	47.5	7	0.072	0	1	0	0	1	1	0	0	2600	5.59	1	0	0	0	0	0	0
Erynnis_tages	Hesperiidae	842.5	5	0	1	0	0	1.50	1.0	2.0	1.0	30.0	4	0.129	0	1	0	0	1	0	0	0	2000	4.04	1	0	0	0	0	0	0
Thymelicus_sylvestris	Hesperiidae	832.5	5	0	1	0	0	1.00	1.0	1.0	0.0	26.5		0.101	0	1	0	0	0	1	0	0	2600	4.53	1	0	0	0	0	0	1
Hipparchia_semele	Nymphalidae	814.5	5	0	1	0	0	1.00	1.0	1.0	0.0	51.0	16	0.143	1	1	0	0	1	0	0	0	2000	3.53	1	1	1	0	1	0	0
Hesperia_comma	Hesperiidae	807.5	5	1	1	0	0	1.00	1.0	1.0	0.0	31.0	6	0.333	1	1	0	0	1	0	0	0	2200	3.53	1	0	0	0	0	0	0
Melanargia_galathea	Nymphalidae	802.5	5	0	1	0	0	1.00	1.0	1.0	0.0	47.5		0.107	1	1	0	0	1	1	0	0	2500	3.53	1	0	0	0	0	0	0

species	families	range	conserv_range	conserv_size	OWS	OWS_egg			GEN_Average				WSP_Female_average	WSP_Fe-										ELT_single		FM_Average					AFB_honey		AFB_min_flower
Favonius_quercus	Lycaenidae	777	5	5	1	0	0	0	1.00	1.0	1.0	0.0	32.6	0	0.40	8	0	0	0	1	1	0	0	0	200	5.02	0	0	0	1	0	1	1
Plebejus_idas	Lycaenidae	774	5	5	1	0	0	0	1.50	1.0	2.0	1.0	24.5		0.04	1	0	1	0	0	1	0	0	100	230	5.00	1	0	0	0	0	0	0
Lycaena_virgaureae	Lycaenidae	756	5	5	0	1	0	0	1.00	1.0	1.0	0.0	27.6	0	0.40	8	1	0	0	0	1	0	0	200	230	5.00	1	0	0	0	0	0	0
Iphiclides_podalirius	Papilionidae	755	5	5	0	0	1	0	2.00	1.0	3.0	2.0	77.0	26	0.10	5	1	1	0	0	1	0	0	0	200	6.04	1	0	1	0	0	1	0
Cupido_minimus	Lycaenidae	753	5	5	0	1	0	0	1.50	1.0	2.0	1.0	23.0	4	0.10	5	0	1	0	0	1	0	0	0	280	6.00	1	0	0	0	0	1	1
Coenonympha_arcania	Nymphalidae	736	5	[illegible]	0	1	0	0	1.25	1.0	1.5	0.5	37.6	0	0.16	9	0	1	0	0	1	1	0	0	230	3.53	1	0	1	0	0	0	0
Aricia_agestis	Lycaenidae	700	5	5	0	1	0	0	2.00	1.0	3.0	2.0	25.6	0	0.10	2	1	1	0	0	1	0	0	0	190	7.00	1	0	0	0	0	1	1
Brenthis_ino	Nymphalidae	699	5	5	1	1	0	0	1.00	1.0	1.0	0.0	37.8	0	0.20	4	1	1	0	0	1	1	0	0	200	2.51	1	0	1	0	0	0	0
Colias_hyale	Pieridae	682	5	5	0	1	1	0	2.50	2.0	3.0	1.0	45.0	10	0.20	4	1	1	0	0	1	0	0	0	180	6.51	1	0	0	0	0	0	0
Lycaena_tityrus	Lycaenidae	673	5	5	0	1	0	0	2.00	1.0	3.0	2.0	30.0	4	0.13	6	1	1	0	0	1	0	0	0	250	7.00	1	0	0	0	0	0	0
Melitaea_cinxia	Nymphalidae	673	5	5	0	1	0	0	1.50	1.0	2.0	1.0	35.5	9	0.28	9	1	1	0	0	0	0	1	0	260	4.04	1	0	0	0	0	0	0
Thecla_betulae	Lycaenidae	628	5	5	1	0	0	0	1.00	1.0	1.0	0.0	35.0	0	0.12	9	0	0	1	0	1	0	0	0	160	4.51	1	0	0	1	0	0	0

species	families		conservation		OWS				GEN_Average				WSP_Female_average		WSP_Fe-						ELT_sin-					FM_Average					AFB_honey	AFB_	AFB_min	flower
Araschnia_levana	Nymphalidae	626	5	5	0	0	1	0	2.0	1.0	3.0	2.0	33.5	11	0.70	7	0	1	0	0	0	1	1	0	170	5.0	0.02	1	0	1	0	0	0	0
Melitaea_didyma	Nymphalidae	625	5	5	0	1	0	0	2.5	2.0	3.0	1.0	37.0	14	0.05	1	0	1	0	0	0	0	1	0	270	5.0	0.55	1	0	0	0	0	0	0
Carcharodus_alceae	Hesperiidae	615	5	5	0	1	0	0	2.5	2.0	3.0	1.0	30.0	8	0.16	7	0	1	0	0	1	0	0	0	300	8.0	0.04	1	0	0	0	0	0	0
Glaucopsyche_alexis	Lycaenidae	609	5	5	0	0	1	0	1.0	1.0	1.0	0.0	29.0	8	0.06	5	0	1	0	0	1	0	0	0	190	5.0	0.00	1	0	0	0	0	1	1
Lysandra_bellargus	Lycaenidae	601	5	5	0	1	0	0	2.0	1.0	3.0	2.0	31.0	6	0.18	3	1	0	0	0	1	0	0	100	190	7.0	0.00	1	0	0	0	0	1	1
Satyrium_ilicis	Lycaenidae	586	5	5	1	0	0	0	1.0	1.0	1.0	0.0	34.0	4	0.11	2	0	0	1	0	1	0	0	0	180	4.0	0.00	0	0	1	0	0	0	0
Carterocephalus_palaemon	Hesperiidae	585	5	5	0	1	0	0	1.0	1.0	1.0	0.0	27.0	6	0.12	6	0	1	0	0	1	0	0	0	180	2.0	0.51	1	0	0	0	0	0	0
Coenonympha_glycerion	Nymphalidae	574	5	5	0	1	0	0	1.5	1.0	2.0	1.0	28.0	6	0.25	8	0	1	0	0	1	0	0	200	220	3.0	0.00	1	0	0	0	0	1	0
Apatura_iris	Nymphalidae	575	5	5	0	1	0	0	1.0	1.0	1.0	0.0	70.0	10	0.31	6	0	0	1	0	1	0	0	0	230	2.0	0.51	1	0	0	1	1	1	1
Erebia_ligea	Nymphalidae	564	5	5	1	1	0	0	0.75	0.5	1.0	0.5	41.0	10	0.18	3	1	1	0	0	1	0	0	0	250	3.0	0.02	1	0	0	0	0	0	1
Boloria_dia	Nymphalidae	554	5	5	0	1	0	0	2.0	1.0	3.0	2.0	33.0	2	0.44	7	0	1	0	0	1	0	0	0	200	5.0	0.53	1	0	0	0	0	0	0
Coenonympha_tullia	Nymphalidae	553	5	5	0	1	0	0	1.0	1.0	1.0	0.0	31.5	11	0.11	5	0	1	0	0	1	0	0	0	140	2.0	0.02	1	0	1	0	0	0	0

species	families								GEN_Average				WSP_Female_average	WSP_Fe…						ELT_sin…					FM_Average	AFB_Average			honey	AFB_min…	flower
Satyrium_w-album	Lycaenidae	553	5	5	1	0	0	0	1.0	1.0	1.0	0.0	30.0	4	0.0650	0	1	1	1	0	0	0	170	3.00	1	0	0	1	0	0	0
Polyommatus_amandus	Lycaenidae	544	5	5	0	1	0	0	1.5	1.0	2.0	1.0	31.6	0	0.2041	1	0	0	1	0	0	100	200	3.00	1	0	0	0	0	0	1
Euphydryas_aurinia	Nymphalidae	538	5	5	0	1	0	0	1.0	1.0	1.0	0.0	36.5	13	0.1021	1	0	0	0	0	1	0	260	3.53	1	0	0	0	0	0	0
Apatura_ilia	Nymphalidae	528	5	5	0	1	0	0	1.5	1.0	2.0	1.0	68.8	8	0.2670	0	1	1	1	0	0	50	185	4.53	1	0	0	1	1	1	1
Limenitis_camilla	Nymphalidae	526	5	5	0	1	0	0	1.0	1.0	1.0	0.0	56.8	8	0.2890	0	1	1	1	0	0	0	150	3.02	1	1	1	1	1	1	1
Melitaea_phoebe	Nymphalidae	525	5	5	0	1	0	0	1.5	1.0	2.0	1.0	44.5	11	0.1540	1	0	0	0	0	1	0	270	4.55	1	0	0	0	0	0	1
Pyronia_tithonus	Nymphalidae	515	5	5	0	1	0	0	1.0	1.0	1.0	0.0	36.0	4	0.0811	1	0	0	1	0	0	0	230	3.53	1	0	1	0	0	0	0
Hamearis_lucina	Riodinidae	497	5	5	0	0	1	0	1.0	1.0	1.0	0.0	32.5	3	0.5771	1	0	0	0	1	0	0	170	6.00	1	0	0	0	0	0	0
Colias_alfacariensis	Pieridae	494	5	5	0	1	0	0	2.5	2.0	3.0	1.0	43.5	3	0.1671	1	0	0	1	0	0	0	260	6.51	1	0	0	0	0	0	0
Satyrium_spini	Lycaenidae	483	5	5	1	0	0	0	1.0	1.0	1.0	0.0	30.0	4	0.1670	0	1	0	1	1	0	0	200	3.51	1	0	1	1	0	0	0
Agriades_optilete	Lycaenidae	480	5	5	0	1	0	0	1.0	1.0	1.0	0.0	25.8	8	0.2181	1	0	0	1	0	0	0	280	3.00	1	0	1	0	0	1	0
Boloria_aquilonaris	Nymphalidae	478	5	5	0	1	0	0	1.0	1.0	1.0	0.0	36.8	8	0.2891	1	0	0	1	0	0	100	190	2.02	1	0	1	0	0	0	0

species	families	range	conservation		OWS	OWS_egg	OWS_larva		GEN_Average				WSP_Female_average	WSP_Female							ELT_single					FM_Average					AFB_honey	AFB_i	AFB_min-flower
Cupido_argiades	Lycaenidae	478	5	5	0	1	0	0	2.00	2.0	2.0	0.0	29.0	2	0.07	2	0	1	0	0	1	0	0	0	160	6.00	1	0	0	0	0	0	0
Pyrgus_alveus	Hesperiidae	476	5	5	0	1	0	0	1.00	1.0	1.0	0.0	28.5	7	0.35	4	0	1	0	0	1	0	0	0	230	3.53	1	0	0	0	0	0	0
Eumedonia_eumedon	Lycaenidae	441	5	5	0	1	0	0	1.00	1.0	1.0	0.0	28.0	8	0.21	8	1	1	0	0	1	0	0	0	240	4.00	1	0	0	0	0	0	0
Aricia_artaxerxes	Lycaenidae	435	5	5	0	1	0	0	1.00	1.0	1.0	0.0	27.5	7	0.05	6	1	1	0	0	1	0	0	0	220	4.00	1	0	0	0	0	0	0
Colias_palaeno	Pieridae	417	5	5	1	1	0	0	1.00	1.0	1.0	0.0	47.0	10	0.70	7	1	1	0	0	1	0	0	0	250	3.00	1	0	1	0	0	0	0
Brintesia_circe	Nymphalidae	416	5	5	0	1	0	0	1.00	1.0	1.0	0.0	73.0	14	0.20	4	1	1	0	0	0	1	0	0	230	4.53	1	0	0	0	1	1	1
Limenitis_reducta	Nymphalidae	410	5	5	0	1	0	0	2.00	1.0	3.0	2.0	50.0	8	0.57	7	0	0	1	0	1	0	0	0	195	5.04	1	0	1	1	1	1	1
Satyrium_pruni	Lycaenidae	408	5	5	1	0	0	0	1.00	1.0	1.0	0.0	31.5	9	0.13	4	0	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Lycaena_dispar	Lycaenidae	383	5	5	0	1	0	0	2.00	1.0	3.0	2.0	37.0	8	0.40	8	1	1	0	0	1	1	0	0	100	6.51	1	0	1	1	0	0	0
Spialia_sertorius	Hesperiidae	380	5	5	0	1	0	0	2.00	1.0	3.0	2.0	24.0	4	1.00	0	1	1	0	0	1	0	0	0	170	7.04	1	0	0	0	0	0	0

species	families	range	con-servation…			OWS…			GEN_Av-…	WSP_Female_aver-…								ELT_sin-… / FM_Aver-…					AFB_ey-…		AFB_min-…
Parnassius_mnemosyne	Papilionidae	371	4	5	1	0	0	0	1.001.01.00.058.012	0.3541	0	0	0	1	0	0	0	2503.00	1	0	0	0	0	0	0
Hyponephele_lycaon	Nymphalidae	365	5	5	0	1	0	0	1.001.01.00.038.8	0.2040	1	0	0	1	0	0	0	2503.53	1	0	0	0	0	0	0
Erebia_medusa	Nymphalidae	365	5	5	0	1	0	0	0.750.51.00.538.8	0.2241	1	0	0	1	0	0	200	2353.51	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	1	1	1	0	3.003.03.00.033.6	0.0580	1	0	0	1	0	0	0	2709.00	1	0	0	0	0	0	0
Euchloe_ausonia	Pieridae	352	5	5	0	0	1	0	2.001.03.02.044.8	0.1260	1	0	0	1	0	0	0	1905.02	1	0	0	0	0	0	0
Lasiommata_petropolitana	Nymphalidae	352	5	5	0	1	1	0	1.501.02.01.038.6	0.2580	1	0	0	1	0	0	100	1253.53	1	0	0	0	0	0	1
Polyommatus_thersites	Lycaenidae	351	5	5	0	1	0	0	2.001.03.02.029.6	0.5001	1	0	0	1	0	0	0	2207.00	1	0	0	0	0	0	0
Satyrium_acaciae	Lycaenidae	349	5	5	1	0	0	0	1.001.01.00.030.4	1.0001	0	1	0	1	0	0	0	2003.02	1	0	1	0	0	0	0
Erebia_aethiops	Nymphalidae	326	5	5	0	1	0	0	1.001.01.00.047.100	0.0431	1	0	0	1	0	0	0	2003.51	1	0	0	0	0	0	0
Brenthis_daphne	Nymphalidae	323	5	5	1	1	0	0	1.001.01.00.047.100	0.4470	0	1	0	1	0	0	0	2303.51	1	0	1	0	0	0	0
Argynnis_pandora	Nymphalidae	320	5	5	0	1	0	0	1.501.02.01.072.016	0.5171	1	0	0	1	0	0	0	2605.04	1	0	0	0	0	1	1

species	families	range	conservation																															
Boloria_eunomia	Nymphalidae	315	5	5	0	1	0	0	1.00	0.01	1.0	0.0	36.5	7	0.18	3	0	1	0	0	1	1	0	50	185	3	0.00	1	0	0	0	0	0	0
Pyrgus_armoricanus	Hesperiidae	311	5	5	0	1	0	0	1.50	0.02	2.0	1.0	26.0	4	0.18	3	0	1	1	0	1	0	0	0	190	5	0.55	1	0	0	0	0	0	1
Polyommatus_daphnis	Lycaenidae	305	5	5	1	0	0	0	1.00	0.01	1.0	0.0	35.0	6	0.12	9	1	1	0	0	1	0	0	200	180	3	0.00	1	0	0	0	0	0	1
Gonepteryx_cleopatra	Pieridae	303	5	5	0	0	0	1	2.00	0.03	3.0	2.0	59.0	18	0.57	7	0	0	1	0	1	0	0	0	200	7	0.53	1	0	0	0	0	0	0
Plebejus_argyrognomon	Lycaenidae	290	5	5	1	1	0	0	1.50	0.02	2.0	1.0	31.0	6	0.22	4	0	1	0	0	1	0	0	300	140	4	0.00	1	0	0	0	0	0	0
Leptotes_pirithous	Lycaenidae	287	5	5	0	1	1	0	3.00	0.03	3.0	0.0	25.0	2	0.04	5	0	1	0	0	1	0	0	0	190	8	0.00	1	0	1	0	0	0	0
Carcharodus_floccifera	Hesperiidae	277	4	5	0	1	0	0	1.50	0.02	2.0	1.0	30.0	4	0.17	4	0	1	0	0	1	0	0	0	200	4	0.51	1	0	0	0	0	0	1
Heteropterus_morpheus	Hesperiidae	270	5	5	0	1	0	0	1.00	0.01	1.0	0.0	33.5	7	0.25	0	0	1	0	0	1	0	0	0	150	3	0.02	1	0	0	0	0	0	0
Melitaea_aurelia	Nymphalidae	268	1	5	0	1	0	0	1.00	0.01	1.0	0.0	30.0	4	0.08	3	0	1	0	0	0	1	1	100	200	2	0.00	1	0	0	0	0	0	0

species	families	range	[illegible]	[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Female_[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_[illegible]	[illegible]	[illegible]	AFB_min_flower
Pyrgus_carthami	Hesperiidae	264	5	5	0	1	0	0	1.00	1.0	1.0	0.0	32.0	4	0.20	0.18	1	1	0	0	1	1	0	0	180	5.000	1	0	0	0	0	0	1
Arethusana_arethusa	Nymphalidae	229	5	5	0	1	0	0	1.00	1.0	1.0	0.0	41.0	6	0.33	0.33	1	1	0	0	0	1	0	0	230	3.051	1	0	0	0	0	0	0
Carterocephalus_silvicola	Hesperiidae	222	5	5	0	1	0	0	1.00	1.0	1.0	0.0	25.0	6	0.20	0.00	0	1	0	0	1	0	0	0	500	2.51	1	0	0	0	0	0	0
Pseudophilotes_baton	Lycaenidae	222	5	5	0	1	1	0	1.50	1.0	2.0	1.0	24.0	4	0.10	0.24	0	1	0	0	1	0	0	100	190	5.000	1	0	0	0	0	0	0
Pyronia_cecilia	Nymphalidae	219	5	5	0	1	0	0	1.00	1.0	1.0	0.0	31.0	2	0.10	0.77	0	1	0	0	1	0	0	0	230	3.051	1	0	0	0	0	0	1
Zerynthia_polyxena	Papilionidae	215	5	5	0	0	1	0	1.00	1.0	1.0	0.0	49.0	6	0.50	0.00	0	1	0	0	1	1	0	0	170	4.000	1	0	0	0	0	0	0
Euphydryas_maturna	Nymphalidae	213	5	5	0	1	1	0	0.75	0.5	1.0	0.5	41.5	9	0.04	0.46	0	1	1	1	0	0	1	100	900	2.51	1	0	0	1	0	0	0
Erebia_euryale	Nymphalidae	203	5	5	1	1	0	0	0.75	0.5	1.0	0.5	44.0	4	0.09	0.96	0	1	0	0	1	0	0	600	190	3.002	1	0	0	0	0	0	0
Pieris_mannii	Pieridae	203	5	5	0	0	1	0	3.00	3.0	3.0	0.0	43.0	6	0.40	0.08	1	1	0	0	1	0	0	0	200	7.055	1	0	0	0	0	0	0
Lycaena_helle?	Lycaenidae	199	5	5	0	1	1	0	2.00	1.0	3.0	2.0	30.0	4	0.08	0.89	NA	NA	NA	NA	1	0	0	0	220	9.004	1	0	0	0	0	0	0
Euchloe_crameri	Pieridae	197	5	5	0	0	1	0	1.50	1.0	2.0	1.0	44.0	8	0.15	0.54	0	1	0	0	1	0	0	NA	NA	3.000	1	0	0	0	0	0	0

species	families	range	conservation		OWS			GEN_Average				WSP_Female_average		WSP_Fe-						ELT_single					FM_Average					AFB_			AFB_min
Erebia_pandrose	Nymphalidae	194	5	0	1	0	0	0.50	0.5	0.5	0.0	40.0	10	0.10	92	1	1	0	0	1	0	0	0	310	2.051		1	1	0	0	0	0	0
Brenthis_hecate	Nymphalidae	190	5	1	0	0	0	1.00	1.0	1.0	0.0	40.8		0.40	80	0	1	0	0	1	0	0	25	227	7.500		1	0	0	0	0	0	0
Libythea_celtis	Nymphalidae	185	[illegible]	0	0	0	1	1.25	1.0	1.5	0.5	44.5		0.70	70	0	0	0	1	1	0	0	0	180	6.053		1	0	0	0	0	0	1
Melitaea_parthenoides	Nymphalidae	172	5	0	1	0	0	1.50	1.0	2.0	1.0	33.6		0.10	50	0	1	0	0	0	1	1	100	230	3.002		1	0	0	0	0	1	1
Polyommatus_escheri	Lycaenidae	167	5	0	1	0	0	1.00	1.0	1.0	0.0	28.8		0.50	00	1	1	0	0	1	0	0	100	190	3.000		1	0	0	0	0	0	0
Oeneis_jutta	Nymphalidae	166	5	0	1	0	0	0.75	0.5	1.0	0.5	53.0	10	0.35	40	0	1	0	0	NA	NA	NA	NA	NA	2.51		0	0	1	0	0	0	0
Pyrgus_centaureae	Hesperiidae	162	5	0	1	0	0	1.00	1.0	1.0	0.0	29.5		1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	100	2.051		1	0	0	0	0	0	0
Polygonia_egea	Nymphalidae	158	5	0	0	0	1	2.00	1.0	3.0	2.0	45.2		0.50	77	0	1	0	0	1	1	0	0	210	8.055		1	0	0	0	0	0	0
Neptis_rivularis	Nymphalidae	150	5	0	1	0	0	1.00	1.0	1.0	0.0	52.4		0.25	58	NA	NA	NA	NA	1	0	0	100	150	3.051		0	0	1	0	0	0	0
Lycaena_helle	Lycaenidae	148	5	0	0	1	0	1.25	1.0	1.5	0.5	24.6		0.28	89	0	1	0	0	1	0	0	100	170	6.000		1	0	1	0	0	0	0
Cupido_alcetas	Lycaenidae	146	5	0	1	0	0	2.50	2.0	3.0	1.0	29.6		0.18	83	0	1	0	0	1	0	0	0	100	7.000		1	0	0	0	0	0	0
Boloria_frigga	Nymphalidae	145	5	0	1	0	0	1.00	1.0	1.0	0.0	42.5	11	0.70	70	0	0	1	0	1	0	0	100	350	2.000		1	0	0	0	0	0	0

species	families		con-serv			OWS			GEN_Av				WSP_Female_aver		WSP_Fe						ELT_sin					FM_Aver				AFB_Honey		AFB_An	AFB_min-flower
Boloria_freija	Nymphalidae	145		5	0	1	0	0	1.00	1.0	1.0	0.0	34.5	11	0.158		0	0	1	0	1	0	0	200	800	2.51	1	0	0	0	0	0	0
Satyrus_ferula	Nymphalidae	145		5	0	1	0	0	1.00	1.0	1.0	0.0	55.0	10	0.500		1	1	0	0	0	1	0	0	220	4.02	1	0	0	0	0	1	1
Hyponephele_lupina	Nymphalidae	143		5	0	1	0	0	1.00	1.0	1.0	0.0	45.6	[illegible]	0.169		1	1	0	0	1	0	0	0	230	4.055	1	0	0	1	1	0	0
Boloria_titania	Nymphalidae	141		5	1	1	0	0	1.00	1.0	1.0	0.0	39.5	9	0.500		0	1	0	0	1	0	0	100	200	3.000	1	0	0	0	0	0	0
Erebia_meolans	Nymphalidae	139		5	0	1	0	0	1.00	1.0	1.0	0.0	46.0	16	0.200		1	1	0	0	1	0	0	150	225	4.000	1	0	0	0	0	0	0
Aricia_cramera	Lycaenidae	138	5	5	1	1	1	1	2.50	2.0	3.0	1.0	25.6	[illegible]	0.112		1	1	0	0	1	0	0	0	250	9.055	1	0	0	0	0	0	1
Colias_erate	Pieridae	138	5	5	0	1	1	0	2.50	2.0	3.0	1.0	49.6	[illegible]	0.113	NA	NA	NA	NA	NA	1	0	0	0	200	4.051	NA	NA	NA	NA	NA	NA	NA
Erebia_epiphron	Nymphalidae	137		5	0	1	0	0	0.75	0.5	1.0	0.5	38.8	[illegible]	0.224		0	1	0	0	1	0	0	350	235	2.051	1	0	0	0	0	0	0
Anthocharis_euphenoides	Pieridae	131	5	5	0	0	1	0	1.00	1.0	1.0	0.0	37.6	[illegible]	0.577		0	1	0	0	1	0	0	0	180	3.051	1	0	0	0	0	0	0
Cupido_osiris	Lycaenidae	131	5	5	0	1	0	0	1.50	1.0	2.0	1.0	27.6	[illegible]	0.289		0	1	0	0	1	0	0	200	180	6.000	1	0	0	0	0	0	1
Spialia_orbifer	Hesperiidae	129	5	5	0	1	0	0	1.50	1.0	2.0	1.0	25.6	[illegible]	0.224	NA	NA	NA	NA	NA	NA	NA	NA	0	250	5.053	1	0	0	0	0	0	0

species	families	values (in printed order)
Zerynthia_rumina	Papilionidae	128 5 5 0 0 1 0 1.25 1.0 1.5 0.5 45.2 0.50 77 1 1 0 0 1 1 0 0 150 5.04 1 0 0 0 0 0 0 0
Charaxes_jasius	Nymphalidae	127 5 0 1 0 0 1.50 1.0 2.0 1.0 79.5 0.10 20 0 0 0 1 1 1 0 0 240 6.53 0 0 0 0 0 0 1 1
Pieris_mannii? / Pieris_ergane	Pieridae	125 5 0 0 1 0 2.00 1.0 3.0 2.0 42.02 0.40 81 1 1 0 0 1 0 0 0 220 7.55 1 0 0 0 0 0 0 1
Erebia_embla	Nymphalidae	123 5 NA NA NA NA 1.00 1.0 1.0 0.0 47.5 0.20 40 1 0 0 NA NA NA 100 300 2.00 NA NA NA NA NA NA NA NA
Pieris_krueperi? (Pieris … oni…)	Pieridae	115 5 0 0 1 0 1.50 1.0 2.0 1.0 38.53 0.20 41 0 0 0 1 1 0 600 270 4.00 1 0 0 0 0 0 0 0
Boloria_napaea	Nymphalidae	112 5 0 1 0 0 1.00 1.0 1.0 0.0 39.6 0.35 41 1 0 0 1 0 0 0 250 3.00 1 0 0 0 0 0 0 0
Melanargia_lachesis	Nymphalidae	115 5 0 1 0 0 1.00 1.0 1.0 0.0 49.8 0.13 61 1 0 0 1 0 0 0 160 2.51 1 0 0 0 0 0 0 0
Melanargia_russiae	Nymphalidae	115 5 0 1 0 0 1.00 1.0 1.0 0.0 55.00 0.12 01 1 0 0 1 0 0 500 190 3.00 1 0 0 0 0 0 0 0
Melitaea_deione	Nymphalidae	108 5 0 1 0 0 1.50 1.0 2.0 1.0 39.04 0.12 01 1 0 0 0 1 1 200 190 4.53 1 0 0 0 0 0 0 1
Coenonympha_dorus	Nymphalidae	107 5 0 1 0 0 1.00 1.0 1.0 0.0 31.6 0.16 90 1 0 0 1 0 0 100 160 3.00 1 0 0 0 0 0 1 0
Satyrium_esculi	Lycaenidae	106 5 1 0 0 0 1.00 1.0 1.0 0.0 32.0 0.70 70 0 1 1 1 0 0 100 120 4.00 1 0 0 0 0 0 0 0
Pyrgus_onopordi	Hesperiidae	105 5 5 0 1 0 0 2.50 2.0 3.0 1.0 25.6 0.50 77 1 1 0 0 1 0 0 0 280 7.00 1 0 0 0 0 0 0 1

species	families	range	conservation	con-	OWS	OWS_		GEN_Average				WSP_Female_average	WSP_Fe-							ELT_single					FM_Average				AFB_Average		hori-an-	AFB_min-flower
Neptis_sappho	Nymphalidae	104.5	5	0	1	0	0	1.50	1.0	2.0	1.0	54.8	0	0.48	NA	NA	NA	NA	NA	1	0	0	100	145	4.051	NA	NA	NA	NA	NA	NA	NA
Pyronia_bathseba	Nymphalidae	104.5	5	0	1	0	0	1.00	1.0	1.0	0.0	37.2	0	0.35	54	1	1	0	0	1	0	0	100	190	4.051	1	0	0	0	0	0	0
Glaucopsyche_melanops	Lycaenidae	103.5	5	0	0	1	0	1.00	1.0	1.0	0.0	27.0	10	0.22	24	0	1	0	0	1	0	0	100	100	2.000	1	0	0	0	0	0	1
Boloria_pales	Nymphalidae	105.5	5	0	1	0	0	1.00	1.0	1.0	0.0	36.8	0	0.25	58	0	1	0	0	1	0	0	150	160	3.002	1	0	0	0	0	0	0
Erebia_gorge	Nymphalidae	92.5	5	0	1	0	0	0.50	0.5	0.5	0.0	37.6	0	0.30	16	0	1	0	0	NA	NA	NA	1600	150	3.000	NA	NA	NA	NA	NA	NA	NA
Hipparchia_fidia	Nymphalidae	92.5	5	0	1	0	0	1.00	1.0	1.0	0.0	59.6	0	0.10	44	0	1	0	0	1	0	0	0	140	3.051	1	0	0	0	0	1	1
Erebia_manto	Nymphalidae	89.5	5	1	1	0	0	0.50	0.5	0.5	0.0	39.0	10	0.30	16	0	1	0	0	1	0	0	900	160	3.000	1	0	0	0	0	0	0
Erebia_oeme	Nymphalidae	89.5	5	0	1	0	0	0.75	0.5	1.0	0.5	42.8	0	0.10	0	1	1	0	0	1	0	0	800	180	3.000	1	0	0	0	0	0	0
Muschampia_proto	Hesperiidae	88.5	5	1	0	0	0	1.00	1.0	1.0	0.0	34.5	9	0.50	77	1	1	0	0	1	0	0	0	200	4.002	1	0	0	0	0	0	1
Kirinia_roxelana	Nymphalidae	86.5	5	0	1	0	0	1.00	1.0	1.0	0.0	60.4	0	0.24	NA	NA	NA	NA	NA	NA	NA	NA	0	230	6.053	NA	NA	NA	NA	NA	NA	NA
Melanargia_occitanica	Nymphalidae	85.5	5	0	1	0	0	1.00	1.0	1.0	0.0	51.0	10	0.15	54	1	1	0	0	1	0	0	0	200	2.051	1	0	0	0	0	0	0

species	families		con-serv… range	con-serv… size	OWS…	OWS_lar…			GEN_Av-…				WSP_Female_average	WSP_Fe-…					ELT_sin-…					FM_Av-er-…			AFB_hon-ey-…	AFB_…i-…	AFB_an-…	AFB_min-flower
Pyrgus_andromedae	Hesperiidae	83	5	5	0	1	0	0	1.00	1.0	1.0	0.0	28.5	0.2889	NA	NA	NA	NA	NA	NA	NA	1600	1700	3.002	1	0	0	0	0	0	0
Laeosopis_roboris	Lycaenidae	82	5	5	1	0	0	0	1.00	1.0	1.0	0.0	27.60	0.7071	1	0	0	1	1	0	0	100	1500	3.000	1	0	0	0	0	0	0
Erebia_pronoe	Nymphalidae	81	5	5	0	1	0	0	1.00	1.0	1.0	0.0	46.80	0.7[illegible]	NA	NA	NA	NA	NA	NA	NA	900	1900	3.051	1	0	0	0	0	0	0
Boloria_thore	Nymphalidae	79	5	5	0	1	0	0	1.25	1.0	1.5	1.0	44.60	0.5077	0	1	0	0	1	0	0	300	1500	2.002	1	0	0	0	0	0	0
Melanargia_ines	Nymphalidae	79	5	5	0	1	0	0	1.00	1.0	1.0	0.0	48.40	0.5000	0	1	0	0	NA	NA	NA	0	2600	4.000	1	0	0	0	0	0	0
Aricia_cramera	Lycaenidae	78	5	5	0	1	0	0	1.00	1.0	1.0	0.0	25.5	0.7070	0	1	0	0	1	0	0	0	300	2.000	1	0	0	0	0	0	0
Pyrgus_sidae	Hesperiidae	77	5	5	0	1	0	0	1.00	1.0	1.0	0.0	35.60	0.31[illegible]	NA	NA	NA	NA	NA	NA	NA	0	2300	4.002	1	0	0	0	0	0	1
Gegenes_pumilio	Hesperiidae	76	5	5	0	1	0	0	3.00	3.0	3.0	0.0	32.40	0.3540	0	1	0	0	1	0	0	0	1800	9.000	1	0	0	0	0	0	0
Melanargia_larissa	Nymphalidae	73	5	5	0	1	0	0	1.00	1.0	1.0	0.0	55.00	0.7071	1	1	0	0	1	0	0	0	2400	4.002	1	0	0	0	0	0	0
Satyrus_actaea	Nymphalidae	73	5	5	0	1	0	0	1.00	1.0	1.0	0.0	55.00	0.2361	1	1	0	0	1	0	0	100	1900	3.000	1	0	0	0	0	0	0
Erebia_triarius	Nymphalidae	72	5	5	0	1	0	0	1.00	1.0	1.0	0.0	47.60	0.2889	1	1	0	0	NA	NA	NA	400	2100	4.000	1	0	0	0	0	0	1
Nymphalis_vaualbum	Nymphalidae	72	5	5	0	0	0	1	1.00	1.0	1.0	0.0	63.00	0.3540	0	0	0	1	0	0	1	0	1500	3.053	0	0	0	0	0	0	1

species	families																														
Cupido_decoloratus	Lycaenidae	67	4	5	0	1	1	0	2.50	2.0	3.0	1.0	25.2	0.258	0	1	0	0	NA	NA	NA	0	120	5.000	1	0	0	0	0	0	0
Leptidea_duponcheli	Pieridae	67	5	5	0	0	1	0	2.00	2.0	2.0	0.0	38.8	0.408	1	1	0	0	1	0	0	0	240	5.000	1	0	0	0	0	0	0
Erebia_albergana	Nymphalidae	65	5	5	0	1	0	0	1.00	1.0	1.0	0.0	43.6	0.333	NA	NA	NA	NA	NA	NA	NA	900	130	3.000	1	0	0	0	0	0	1
Erebia_cassioides	Nymphalidae	65	5	5	0	1	0	0	1.00	1.0	1.0	0.0	37.6	1.000	1	1	0	0	1	0	0	1500	110	3.002	1	0	0	0	0	0	1
Gegenes_nostrodamus	Hesperiidae	65	5	5	1	1	1	1	3.00	3.0	3.0	0.0	32.4	0.289	0	1	0	0	1	0	0	0	190	9.000	1	0	0	0	0	0	1
Agriades_orbitulus	Lycaenidae	63	5	5	0	1	0	0	1.00	1.0	1.0	0.0	26.4	0.258	NA	NA	NA	NA	1	0	0	800	190	3.000	0	0	0	0	0	0	1
Euchloe_belemia	Pieridae	63	5	5	0	0	1	0	2.00	2.0	2.0	0.0	40.8	0.354	1	0	0	0	1	0	0	0	150	5.000	1	0	0	0	0	0	0
Coenonympha_gardetta	Nymphalidae	61	5	5	0	1	0	0	1.00	1.0	1.0	0.0	31.2	0.577	NA	NA	NA	NA	1	1	0	800	220	4.000	1	0	0	0	0	0	0
Pontia_callidice	Pieridae	60	5	5	0	0	1	0	1.50	1.0	2.0	1.0	47.10	0.102	1	0	0	0	1	0	0	0	340	4.000	1	0	0	0	0	0	0
Erebia_pharte	Nymphalidae	59	5	5	0	1	0	0	0.50	0.5	0.5	0.0	36.8	0.167	NA	NA	NA	NA	NA	NA	NA	1000	150	2.000	1	0	0	0	0	0	0
Euphydryas_cynthia	Nymphalidae	58	5	5	0	1	0	0	0.75	0.5	1.0	0.5	37.10	0.289	1	1	0	0	0	1	1	900	220	3.000	1	0	0	0	0	0	0

species	families																															
Polyommatus_admetus	Lycaenidae	57	5	5	0	1	0	0	1.00	1.0	1.0	0.0	34.8	0.71	071	1	1	0	0	NA	NA	NA	100	1700	3.00	1	0	0	0	0	0	0
Carchaeodus_baeticus	Hesperiidae	56	5	5	0	1	0	0	2.50	2.0	3.0	1.0	30.4	0.40	081	1	1	0	0	1	0	0	500	1100	4.04	1	0	0	0	0	0	1
Erebia_melampus	Nymphalidae	56	5	5	0	1	0	0	1.00	1.0	1.0	0.0	33.6	0.28	89	NA	NA	NA	NA	NA	NA	NA	800	1600	3.00	1	0	0	0	0	0	0
Euchloe_tagis	Pieridae	56	5	5	0	0	1	0	1.00	1.0	1.0	0.0	35.00	0.50	77	1	1	1	0	1	0	0	0	1600	3.00	1	0	0	0	0	0	0
Hipparchia_senthes	Nymphalidae	56	5	5	0	1	0	0	1.00	1.0	1.0	0.0	52.4	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	2200	0.02	1	0	0	0	0	0	0
Pyrgus_cacaliae	Hesperiidae	55	5	5	0	1	0	0	1.00	1.0	1.0	0.0	28.5	0.57	[illegible]	NA	NA	NA	NA	NA	NA	NA	1800	1000	0.51	1	0	0	0	0	0	0
Carchaeodus_orientalis	Hesperiidae	54	5	5	NA	NA	NA	NA	2.50	2.0	3.0	1.0	29.2	0.57	[illegible]	NA	NA	NA	NA	NA	NA	NA	0	200	4.51	NA	NA	NA	NA	NA	NA	NA
Hipparchia_syriaca	Nymphalidae	54	5	5	0	1	0	0	1.00	1.0	1.0	0.0	65.6	0.28	89	1	1	0	0	1	0	0	0	200	5.55	0	0	0	0	1	0	0
Coenonympha_oedippus	Nymphalidae	52	2	1	0	1	0	0	1.00	1.0	1.0	0.0	38.8	0.25	58	0	1	0	0	1	0	0	0	500	3.00	1	0	1	1	0	0	0
Erebia_pluto	Nymphalidae	51	5	5	0	1	0	0	0.75	0.5	1.0	0.5	45.00	0.35	41	1	1	0	0	1	0	0	1600	1600	2.51	NA	NA	NA	NA	NA	NA	NA

species	families								GEN_Average				WSP_Female_average		WSP_Female					ELT_single					FM_Average					AFB_Honey		AFB_min_flower
Pieris_krueperi	Pieridae	51	5	5	0	0	1	0	4.00	4.0	4.0	0.0	46.0	8	0.707	0	1	0	0	1	0	0	0	200	8.00	1	0	0	0	0	0	0
Tomares_ballus	Lycaenidae	51	5	5	0	0	1	0	1.00	1.0	1.0	0.0	29.0	2	0.125	0	1	0	0	1	0	0	200	110	4.02	1	0	0	0	0	0	0
Gonepteryx_farinosa	Pieridae	50	5	5	0	0	0	1	1.00	1.0	1.0	0.0	60.0	8	0.577	0	0	1	0	1	0	0	0	250	11.00	1	0	0	0	0	0	0
Lysandra_hispana	Lycaenidae	50	5	5	1	0	0	0	2.00	2.0	2.0	0.0	34.0	4	1.000	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1
Papilio_alexanor	Papilionidae	49	5	5	0	0	1	0	1.00	1.0	1.0	0.0	64.0	4	0.118	0	1	0	0	NA	NA	NA	0	240	4.00	1	0	0	0	0	0	0
Erebia_neoridas	Nymphalidae	48	5	5	0	1	0	0	1.00	1.0	1.0	0.0	41.0	10	0.289	0	1	0	0	1	0	0	500	110	2.51	1	0	0	0	0	0	0
Hipparchia_fatua	Nymphalidae	48	5	5	0	1	0	0	1.00	1.0	1.0	0.0	57.5	15	0.354	1	1	0	0	NA	NA	NA	0	180	6.51	NA	NA	NA	NA	NA	NA	NA
Minois_dryas	Nymphalidae	48	5	5	0	1	0	0	1.00	1.0	1.0	0.0	62.0	16	0.200	1	1	0	0	0	1	0	0	160	3.02	1	0	0	0	0	1	0
Apatura_metis	Nymphalidae	47	5	5	0	1	0	0	1.50	1.0	2.0	1.0	62.0	4	1.000	0	0	1	1	1	0	0	0	650	4.00	1	0	1	1	1	1	1
Oeneis_glacialis	Nymphalidae	46	5	5	0	1	0	0	0.50	0.5	0.5	0.0	53.0	6	1.000	NA	NA	NA	NA	1	0	0	1400	150	3.00	1	0	0	0	0	0	0
Agriades_glandon	Lycaenidae	45	5	5	0	1	0	0	1.00	1.0	1.0	0.0	23.0	2	0.354	0	1	0	0	NA	NA	NA	1600	110	2.00	1	0	0	0	0	0	0
Pseudochazara_anthelea	Nymphalidae	45	5	5	NA	NA	NA	NA	1.00	1.0	1.0	0.0	51.0	4	0.289	1	1	0	0	NA	NA	NA	0	240	4.02	1	0	0	0	0	0	0

species	families		conservation		OWS		OWS_		GEN_Average				WSP_Female_average	WSP_Fe-						ELT_single					FM_Average				AFB_honey			AFB_minimal_flower
Aricia_anteros	Lycaenidae	43	4	5	0	1	0	0	2.00	1.0	3.0	2.0	28.8	0.28	89	0	1	0	0	1	0	0	300	2100	5.000	1	0	0	0	0	0	0
Erebia_ottomana	Nymphalidae	42	5	5	0	1	0	0	1.00	1.0	1.00	0.0	39.10	0.707	NA	NA	NA	NA	NA	NA	NA	NA	450	2150	3.002	1	0	0	0	0	0	0
Hipparchia_volgensis	Nymphalidae	42	5	5	NA	NA	NA	NA	1.00	1.0	1.00	0.0	53.5	1.00	0	1	1	0	0	1	0	0	0	2500	4.002	1	0	0	0	0	0	0
Melitaea_varia	Nymphalidae	41	5	5	0	1	0	0	1.00	1.0	1.00	0.0	34.8	0.28	89	1	1	0	0	0	1	1	1200	1400	3.000	1	0	0	0	0	0	0
Lysandra_albicans	Lycaenidae	40	5	5	1	0	0	0	1.00	1.0	1.00	0.0	39.6	1.00	00	0	1	0	0	NA	NA	NA	500	1000	3.000	1	0	0	0	0	0	1
Coenonympha_rhodopensis	Nymphalidae	39	5	5	0	1	0	0	1.00	1.0	1.00	0.0	33.2	0.35	54	0	1	0	0	1	0	0	750	1750	2.051	1	0	0	0	0	0	0
Erebia_montana	Nymphalidae	38	5	5	0	1	0	0	1.00	1.0	1.00	0.0	47.6	0.35	54	1	0	0	0	NA	NA	NA	1100	1400	3.000	1	0	0	0	0	0	0
Boloria_graeca	Nymphalidae	37	5	5	0	1	0	0	1.00	1.0	1.00	0.0	36.8	1.00	00	0	1	0	0	1	0	0	750	1850	4.002	1	0	0	0	0	0	0
Callophrys_avis	Lycaenidae	37	5	5	0	0	1	0	1.00	1.0	1.00	0.0	35.5	0.250	NA	NA	NA	NA	NA	1	0	0	100	900	3.000	1	0	0	0	0	0	0
Lycaena_ottomana	Lycaenidae	37	5	5	0	1	0	0	2.00	2.0	2.00	0.0	29.2	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	1600	7.002	1	0	0	0	0	0	0
Anthocharis_gruneri	Pieridae	36	5	5	0	0	1	0	1.00	1.0	1.00	0.0	33.6	0.408	NA	NA	NA	NA	NA	1	0	0	0	2300	4.004	1	0	0	0	0	0	0
Erebia_disa	Nymphalidae	36	5	5	0	1	0	0	0.50	0.5	0.50	0.0	45.7	0.577	NA	NA	NA	NA	NA	NA	NA	NA	300	200	2.000	NA	NA	NA	NA	NA	NA	NA

species	families																																
Erebia_eriphyle	Nymphalidae	34	5	5	1	1	0	0	0.50	0.5	0.5	0.0	34.0	4	0.500	0	0	1	0	0	NA	NA	NA	120	105	3.00	1	0	0	0	0	0	0
Melanargia_arge	Nymphalidae	33	5	5	0	1	0	0	1.00	1.0	1.0	0.0	53.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	NA	300	120	2.00	1	0	0	0	0	0	0
Aricia_cramera	Lycaenidae	32	5	5	0	1	0	0	1.00	1.0	1.0	0.0	27.5	7	0.183	NA	NA	NA	NA	NA	NA	NA	NA	0	280	4.00	1	0	0	0	0	0	1
Euchloe_simplonia	Pieridae	32	5	5	0	0	1	0	0.75	0.5	1.0	0.5	43.0	6	0.333	1	1	0	0	1	1	0	100	140	4.00	1	0	0	0	0	0	0
Erebia_melas	Nymphalidae	31	5	5	0	1	0	0	1.00	1.0	1.0	0.0	45.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	NA	200	260	3.05	1	0	0	0	0	0	0
Erynnis_marloyi	Hesperiidae	31	5	5	0	1	0	0	2.00	1.0	3.0	2.0	31.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	NA	0	210	6.04	1	0	0	0	0	0	0
Pyrgus_carlinae	Hesperiidae	30	5	5	0	1	0	0	1.00	1.0	1.0	0.0	29.0	6	0.500	NA	NA	NA	NA	NA	NA	NA	NA	150	100	2.00	1	0	0	0	0	0	0
Pyrgus_warrenensis	Hesperiidae	29	5	5	0	1	0	0	1.00	1.0	1.0	0.0	24.5	3	0.577	NA	NA	NA	NA	NA	NA	NA	NA	180	800	2.00	NA	NA	NA	NA	NA	NA	NA
Euphydryas_intermedia	Nymphalidae	28	5	5	0	1	0	0	0.75	0.5	1.0	0.5	40.0	4	0.577	1	0	1	0	0	1	1	140	100	3.00	1	0	0	0	0	0	0
Coenonympha_oedippus	Nymphalidae	27	5	5	0	1	0	0	1.00	1.0	1.0	0.0	33.0	2	0.500	0	0	1	0	0	1	0	0	0	210	3.05	1	0	0	0	0	0	0

species	families	range	conservation	conservation	OWS	OWS	OWS	OWS	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	[illegible]	WSP_Female	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_single	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey	[illegible]	AFB_	AFB_min_flower
Polyommatus_fulgens	Lycaenidae	27	5	5	0	1	0	0	1.00	1.0	1.0	0.0	32.0	1	1.00	0.00	0	1	0	0	NA	NA	NA	900	300	2.00	1	0	0	0	0	0	0
Pseudophilotes_abencerragus	Lycaenidae	27	5	5	0	1	0	0	1.50	1.0	2.0	1.0	20.0	1	0.35	0.54	0	1	0	0	NA	NA	NA	100	140	2.00	1	0	0	0	0	0	1
Melitaea_aetherie	Nymphalidae	26	5	5	0	1	0	0	1.50	1.0	2.0	1.0	44.0	1	0.48	NA	NA	NA	NA	NA	0	1	1	0	180	2.51	1	0	0	0	0	0	1
Erebia_styx	Nymphalidae	25	5	5	0	1	0	0	0.75	0.5	1.0	0.5	51.0	0	0.77	NA	NA	NA	NA	NA	NA	NA	NA	200	200	3.00	1	0	0	0	0	0	0
Erebia_tyndarus	Nymphalidae	25	5	5	0	1	0	0	1.00	1.0	1.0	0.0	35.0	2	0.50	NA	NA	NA	NA	NA	NA	NA	NA	120	150	3.02	1	0	0	0	0	0	0
Spialia_phlomidis	Hesperiidae	25	5	5	0	1	0	0	1.00	1.0	1.0	0.0	27.0	6	0.50	NA	NA	NA	NA	NA	NA	NA	NA	0	220	4.00	NA	NA	NA	NA	NA	NA	NA
Polyommatus_dolus	Lycaenidae	24	5	5	0	1	0	0	1.00	1.0	1.0	0.0	35.0	6	1.00	NA	NA	NA	NA	NA	1	0	0	200	800	2.00	1	0	0	0	0	0	0
Erebia_mnestra	Nymphalidae	22	5	5	0	1	0	0	0.75	0.5	1.0	0.0	36.0	4	0.50	0.00	0	1	0	0	NA	NA	NA	150	110	2.00	1	0	0	0	0	0	0
Muschampia_tessellum	Hesperiidae	22	5	5	NA	NA	NA	NA	1.00	1.0	1.0	0.0	33.5		0.50	NA	NA	NA	NA	NA	NA	NA	NA	0	190	4.51	1	0	0	0	0	0	0
Agriades_aquilo	Lycaenidae	21	5	5	0	1	0	0	0.75	0.5	1.0	0.5	23.0	2	0.28	0.89	0	1	0	0	NA	NA	NA	0	900	3.00	NA	NA	NA	NA	NA	NA	NA
Pseudophilotes_bavius	Lycaenidae	20	5	5	0	0	1	0	1.00	1.0	1.0	0.0	27.0	6	0.57	0.77	0	1	0	0	1	0	0	500	100	3.00	1	0	1	0	0	0	0
Anthocharis_damone	Pieridae	19	5	5	0	0	1	0	1.00	1.0	1.0	0.0	39.5		1.00	NA	NA	NA	NA	NA	1	0	0	0	130	3.02	1	0	0	0	0	0	0

species	families	range	conservation	[illegible]	OWS	[illegible]	OWS_	[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Female	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin…	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey	[illegible]	AFB_min…	[illegible]
Freyeria_trochylus	Lycaenidae	19	5	5	NA	NA	NA	NA	3.00	3.0	3.0	0.0	16.5	3	0.707	NA	NA	NA	NA	NA	NA	NA	NA	0	1000	8.00	1	0	0	0	0	0	0
Oe[illegible]	Nymphalidae	19	5	5	0	1	0	0	0.50	0.5	0.5	0.0	43.0	10	1.000	0	0	1	0	0	NA	NA	NA	100	900	1.51	NA	NA	NA	NA	NA	NA	NA
Pseudochazara_graeca	Nymphalidae	19	5	5	0	1	0	0	1.00	1.0	1.0	0.0	51.0	2	0.289	NA	NA	NA	NA	NA	1	0	0	750	1650	3.02	1	0	0	0	0	0	0
Tarucus_balkanicus	Lycaenidae	19	5	5	0	0	1	0	3.00	3.0	3.0	0.0	20.0	4	0.267	0	0	1	0	0	1	0	0	0	1200	7.00	1	0	0	0	0	0	0
Coenonympha_corinna	Nymphalidae	17	5	[illegible]	0	1	0	0	2.25	1.5	3.0	1.5	29.0	2	0.577	NA	NA	NA	NA	NA	1	0	0	0	2000	4.51	1	0	0	0	0	0	0
Cupido_lorquinii	Lycaenidae	17	5	5	0	0	1	0	1.00	1.0	1.0	0.0	25.0	6	1.000	0	0	1	0	0	NA	NA	NA	100	1900	3.00	1	0	0	0	0	0	1
Erebia_hispania	Nymphalidae	17	5	5	0	1	0	0	1.00	1.0	1.0	0.0	38.0	8	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1650	1250	2.51	1	0	0	0	0	0	1
Erebia_stiria	Nymphalidae	17	5	5	0	1	0	0	1.00	1.0	1.0	0.0	49.0	6	0.408	NA	NA	NA	NA	NA	NA	NA	NA	300	1500	3.00	1	0	0	0	0	0	0
Erebia_polaris	Nymphalidae	16	5	5	0	1	0	0	0.75	0.5	1.0	0.5	39.0	10	0.250	0	0	1	0	0	1	0	0	0	400	1.51	NA	NA	NA	NA	NA	NA	NA
Euchloe_insularis	Pieridae	16	5	5	0	0	1	0	1.75	1.5	2.0	0.5	34.5	3	0.250	0	0	1	0	0	1	0	0	0	1300	5.00	1	0	0	0	0	0	0
Aricia_cramera_ronensis	Lycaenidae	15	5	5	0	1	0	0	1.50	1.0	2.0	1.0	28.0	4	0.577	0	0	1	0	0	1	0	0	900	2100	4.00	1	0	0	0	0	0	0

species	families	conserv_range	conserv...	OWS...	OWS_lar...	OWS_pu...	GEN_Av...				WSP_Female_aver-WSP_Fe...						ELT_sin...					FM_Aver...				AFB_hon-ey...	AFB_i...	AFB_min-AFB_an-flower
Lasiommata_paramegaera	Nymphalidae	15	5	5	0	1	0	0	3.00	3.0	3.0	0.04 2.5	0.35 0.40	1	0	0	1	0	0	0	1500 6.00	1	0	0	0	0	0	0
Melitaea_asteria	Nymphalidae	15	5	5	0	1	0	0	0.50	0.5	0.5	0.02 9.2	1.00 0.01	1	0	0	0	1	1	2000	1000 2.00	1	0	0	0	0	0	0
Colias_aurorina	Pieridae	14	5	5	0	1	0	0	1.00	1.0	1.0	0.05 5.2	0.50 0.70	1	0	0	1	0	0	450	1950 5.00	0	0	1	0	0	0	0
Erebia_nivalis	Nymphalidae	14	5	5	0	1	0	0	0.50	0.5	0.5	0.03 2.0	1.00 NA	NA	NA	NA	NA	1	0	0	2100 500 1.51	1	0	0	0	0	0	0
Euchloe_penia	Pieridae	14	5	5	0	0	1	0	1.50	1.0	2.0	1.03 4.0	0.40 0.81	1	0	0	1	0	0	0	2100 5.00	1	0	0	0	0	0	0
Melitaea_arduinna	Nymphalidae	14	5	5	0	1	0	0	1.00	1.0	1.0	0.04 4.0	0.50 0.71	0	0	0	0	0	1	500	1350 5.51	1	0	0	0	0	0	0
Papilio_hospiton	Papilionidae	14	5	5	0	0	1	0	1.25	1.0	1.5	0.57 6.00	0.10 0.71	1	0	0	1	0	0	50	1450 3.00	1	0	0	0	0	0	0
Pyrgus_cinarae	Hesperiidae	14	5	5	0	1	0	0	1.00	1.0	1.0	0.03 1.2	1.00 NA	NA NA NA NA NA NA NA NA	0	2000	4.02	1	0	0	0	0	0	0				
Archon_apollinus	Papilionidae	13	4	5	0	0	1	0	1.00	1.0	1.0	0.05 7.6	0.50 0.70	1	0	0	0	1	0	0	900 3.53	1	0	0	0	0	0	0
Colias_caucasica	Pieridae	13	5	5	0	1	0	0	1.00	1.0	1.0	0.05 2.0	0.70 0.70	1	0	0	1	0	0	900	1400 3.00	1	0	0	0	0	0	0

species	families	conservation_range	conservation_size	[illegible]	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	[illegible]	GEN_Average	GEN_[illegible]	GEN_[illegible]	[illegible]	WSP_Female_average	WSP_Female_[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_single_[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	AFB_[illegible]	[illegible]	AFB_[illegible]	[illegible]	[illegible]	[illegible]	AFB_min_flower
Erebia_gorgone	Nymphalidae	13	5	5	0	1	0	0	1.00	1.0	1.0	0.0	41.2	0.577	NA	NA	NA	NA	NA	NA	NA	NA	150	950	2.00	1	0	0	0	0	0	0
Hipparchia_aristaeus	Nymphalidae	13	5	5	0	1	0	0	1.00	1.0	1.0	0.0	52.0	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	200	4.55	1	0	0	0	0	0	0
Polyommatus_aroaniensis	Lycaenidae	13	5	5	0	1	0	0	1.00	1.0	1.0	0.0	30.5	1.00	0	0	1	0	0	1	0	0	400	160	3.00	NA	NA	NA	NA	NA	NA	NA
Erebia_lefebvrei	Nymphalidae	12	5	5	0	1	0	0	1.00	1.0	1.0	0.0	44.8	0.77	NA	NA	NA	NA	NA	1	0	0	160	140	3.00	NA	NA	NA	NA	NA	NA	NA
Polyommatus_fabressei	Lycaenidae	11	5	5	0	1	0	0	1.00	1.0	1.0	0.0	30.5	1.00	0	0	1	0	0	NA	NA	NA	900	600	3.00	1	0	0	0	0	0	1
Pontia_chloridice	Pieridae	11	5	5	0	0	1	0	2.50	2.0	3.0	1.0	38.5	0.236	[illegible]	0	1	0	0	1	0	0	0	250	6.04	NA	NA	NA	NA	NA	NA	NA
Erebia_aethiopella	Nymphalidae	10	5	5	0	1	0	0	1.00	1.0	1.0	0.0	38.0	1.00	NA	NA	NA	NA	NA	NA	NA	NA	180	800	2.00	NA	NA	NA	NA	NA	NA	NA
Erebia_rhodopensis	Nymphalidae	10	5	5	0	1	0	0	1.00	1.0	1.0	0.0	36.5	0.577	NA	NA	NA	NA	NA	NA	NA	NA	140	120	1.051	1	0	0	0	0	0	0
Erebia_sthennyo	Nymphalidae	10	5	5	0	1	0	0	1.00	1.0	1.0	0.0	42.0	0.577	NA	NA	NA	NA	NA	NA	NA	NA	170	800	2.51	NA	NA	NA	NA	NA	NA	NA
Plebejus_bellieri	Lycaenidae	10	5	5	NA	NA	NA	NA	1.00	1.0	1.0	0.0	23.0	0.354	NA	NA	NA	NA	NA	NA	NA	NA	0	140	3.00	1	0	0	0	0	0	0
Thymelicus_hyrax	Hesperiidae	10	5	5	NA	NA	NA	NA	1.00	1.0	1.0	0.0	32.5	0.102	NA	NA	NA	NA	NA	NA	NA	NA	0	200	3.00	1	0	0	0	0	0	0

species	families	conservrange	conservcountry	OWS_size	OWS_egg	OWS_larva	OWS_pupa	GEN_Average	GEN_min	GEN_max	...	WSP_Female_average	WSP_Female_...	...	ELT_single	...	FM_Average	...	AFB_honey	AFB_...	AFB_animal	AFB_mineral	AFB_flower
Coenonympha_thyrsis	Nymphalidae	9	5	5	0	1	0	0	2.00	1.00 3.00 2.00 32.0 14 0.28 890	1 0 0	NA NA NA 0	1800	5.04	1	0	0	0	0	0	0	0
Erebia_calcarius	Nymphalidae	9	5	5	0	1	0	0	1.00	1.00 1.00 0.00 38.0 4 0.50 NA NA NA NA NA NA NA NA NA		1600		3.00	1	0	0	0	0	0	0
Erebia_scipio	Nymphalidae	9	5	5	0	1	0	0	0.75	0.5 1.00 0.5 48.0 4 0.50 NA NA NA NA NA NA NA NA NA		1200 1300		2.00	1	0	0	0	0	0	0
Hipparchia_cretica	Nymphalidae	9	5	5	0	1	0	0	1.00	1.00 1.00 0.00 56.0 8 0.28 89 NA NA NA NA NA NA NA NA		0 1500		0.53	1	0	0	0	0	0	0
Hipparchia_neomiris	Nymphalidae	9	5	5	0	1	0	0	1.00	1.00 1.00 0.00 48.0 4 1.00 NA NA NA NA NA NA 1 0 0 0		2000		3.00	NA	NA	NA	NA	NA	NA	NA NA
Kirinia_climene	Nymphalidae	9	5	5	0	1	0	0	1.00	1.00 1.00 0.00 47.0 2 0.70 71 1	1 0 0 1 0 0	700 1100		2.51	1	0	1	0	0	0	0
Chazara_prieuri	Nymphalidae	8	5	5	0	1	0	0	1.00	1.00 1.00 0.00 60.0 12 1.00 NA NA NA NA NA NA NA NA NA		900 1100		2.00	1	0	0	0	0	0	0
Fabriciana_elisa	Nymphalidae	8	5	5	1	1	0	0	1.00	1.00 1.00 0.00 49.0 6 1.00 00 0	1 0 0 1 0 0	400 1600		3.00	1	0	0	0	0	0	0
Kretania_hesperica	Lycaenidae	8	5	5	0	1	0	0	1.00	1.00 1.00 0.00 30.0 4 0.50 00 0	1 0 0 NA NA NA	600 900		4.00	1	0	0	0	0	0	1
Maniola_telmessia	Nymphalidae	7	5	5	0	1	0	0	1.00	1.00 1.00 0.00 41.5 9 0.35 541	1 0 0 1 1 0 0	1300		7.55	1	0	0	0	0	0	0
Spialia_phlomidis / Spialia_therapne	Hesperiidae	7	5	5	NA	NA	NA	NA	2.00	2.00 2.00 0.00 24.0 4 1.00 00 1	1 0 0 1 0 0 0	0 1500		5.00	NA	NA	NA	NA	NA	NA	NA NA

species	families	conserv… range…	con…	…	OWS…	OWS_…	OWS…	GEN_Av…	…	…	…	WSP_Female_average	WSP_Fe…	…	…	…	…	…	ELT_sin…	…	…	…	…	…	FM_Average	…	…	…	AFB_Av…	AFB_…	honey… AFB_min…	… flower
Zerynthia_cretica	Papilionidae	7	5	5	0	0	1	0	1.00	0.0	1.00	0.0	52.5		0.707	0	1	0	0	1	1	0	0	100	400	0.5	1	1	0	0	0	0	0	0
Colias_tyche	Pieridae	6	5	5	0	1	0	0	1.00	0.0	1.00	0.0	45.0	0	0.289	1	0	0	0	1	0	0	0	700	[illegible]	3.0	0	1	0	0	0	0	0	0
Erebia_zapateri	Nymphalidae	6	5	5	0	1	0	0	1.00	0.0	1.00	0.0	38.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	1000	650	3.5	1	1	0	0	0	0	0	0
Pseudochazara_geyeri	Nymphalidae	6	5	5	0	1	0	0	1.00	0.0	1.00	0.0	49.0	2	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1250	2000	2.0	0	1	0	0	0	0	0	0
Agriades_pyrenaicus	Lycaenidae	5	5	5	0	1	0	0	1.00	0.0	1.00	0.0	25.0	6	1.000	1	0	0	0	1	0	0		1800	400	NA	NA	1	0	0	0	0	0	1
Erebia_orientalis	Nymphalidae	5	5	5	0	1	0	0	1.00	0.0	1.00	0.0	30.5	3	0.289	NA	NA	NA	NA	NA	NA	NA	NA	1800	800	2.5	1	1	0	0	0	0	0	0
Erebia_palarica	Nymphalidae	5	5	5	NA	NA	NA	NA	1.00	0.0	1.00	0.0	58.0	4	0.289	1	1	0	0	0	1	0		1000	650	3.0	0	1	0	0	0	0	0	0
Kretania_psylorita	Lycaenidae	5	5	5	NA	NA	NA	NA	1.00	0.0	1.00	0.0	24.5	3	0.577	0	1	0	0	NA	NA	NA		950	1050	2.0	0	1	0	0	0	0	0	0
Maniola_nurag	Nymphalidae	5	5	5	0	1	0	0	1.00	0.0	1.00	0.0	38.0	4	1.000	1	1	0	0	1	1	0		400	900	3.5	1	1	0	0	0	0	0	0
Melanargia_pherusa	Nymphalidae	4	5	5	0	1	0	0	1.00	0.0	1.00	0.0	48.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	600	800	2.5	1	1	0	0	0	0	0	0

species	fam-ilies	con-serv-range	con-serv-size	OWS_egg	OWS_[illegible]	OWS_[illegible]	OWS_[illegible]	GEN_Av-erage	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Fe-male_av-erage	WSP_Fe-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Av-erage	[illegible]	[illegible]	AFB_hon-ey-[illegible]	[illegible]	AFB_an-i-[illegible]	[illegible]	AFB_min-[illegible] flower
Tarucus_theophrastus	Lycaenidae	4	5	5	NA	NA	NA	NA	3.00	3.0	3.0	0.0	21.2	0.354	0	0	1	0	1	0	0	0	2500	6.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_pellucida	Nymphalidae	2	5	5	0	1	0	0	1.00	1.0	1.0	0.0	51.06	0.289	1	1	0	0	1	0	0	0	1000	4.02	1	0	0	0	0	1	0
Maniola_chia	Nymphalidae	2	5	5	0	1	0	0	1.00	1.0	1.0	0.0	41.5	0.289	1	1	0	0	1	1	0	0	800	5.00	1	0	0	0	0	0	0
Hipparchia_christenseni	Nymphalidae	1	5	5	NA	NA	NA	NA	1.00	1.0	1.0	0.0	51.06	0.289	NA	NA	NA	NA	NA	NA	NA	250	650	2.02	NA	NA	NA	NA	NA	NA	NA
Pseudophilotes_barbagiae	Lycaenidae	1	5	5	0	1	0	0	1.00	1.0	1.0	0.0	22.2	1.000	0	1	0	0	NA	NA	NA	700	800	4.00	1	0	0	0	0	0	0
Carcharodus_tripolinus	Hesperiidae	NA	5	5	NA	NA	NA	NA	3.00	3.0	3.0	0.0	30.8	1.000	NA	NA	NA	NA	NA	NA	NA	0	2500	7.00	NA	NA	NA	NA	NA	NA	NA
Cyclyrius_webbianus	Lycaenidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	27.5	0.289	0	1	0	0	0	1	0	200	3300	NA	1	0	0	0	0	0	0
Erebia_rondoui	Nymphalidae	NA	5	5	0	1	0	0	1.00	1.0	1.0	0.0	38.8	1.000	NA	NA	NA	NA	NA	NA	NA	1500	1000	2.00	1	0	0	0	0	0	0
Euchloe_charlonia	Pieridae	NA	5	5	0	0	1	0	2.50	2.0	3.0	1.0	34.4	0.036	1	1	0	0	1	1	0	0	3000	8.051	1	0	0	0	0	0	0
Euchloe_eversi	Pieridae	NA	5	5	0	0	1	0	2.00	2.0	2.0	0.0	40.8	0.289	NA	NA	NA	NA	1	0	0	1700	800	4.00	1	0	0	0	0	0	0
Euchloe_grancanariensis	Pieridae	NA	5	5	NA	NA	NA	NA	2.00	2.0	2.0	0.0	40.8	1.000	NA	NA	NA	NA	NA	NA	NA	50	1900	7.00	NA	NA	NA	NA	NA	NA	NA

species	families	con-serv- range	con-serv- size	OWS_…	OWS_…	OWS_…	OWS_egg	GEN_Av-er…	GEN_…			WSP_Female_average		WSP_Fe…							ELT_sin…				FM_Av-er…			AFB_hon-ey…	AFB_an-i…	AFB_min…		…flower
Euchloe_hesperidum	Pieridae	NA	5	5	NA	NA	NA	NA	2.00	2.0	2.00	0.0	40.8	0	0.289	NA	NA	NA	NA	NA	NA	NA	0	400	6.00	1	0	0	0	0	0	0
Glaucopsyche_paphos	Lycaenidae	NA	5	5	0	0	1	0	1.00	0.0	1.00	0.0	29.6	0	0.289	0	1	0	0	1	0	0	0	1800	NA	NA	NA	NA	NA	NA	NA	NA
Hipparchia_azorina	Nymphalidae	NA	5	5	NA	NA	NA	NA	1.00	0.0	1.00	0.0	41.6	0	1.000	0	1	0	0	NA	NA	NA	480	1520	5.00	1	0	1	0	0	0	0
Hipparchia_cypriensis	Nymphalidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	56.5	13	0.408	1	1	0	0	1	0	0	0	1500	9.00	0	0	0	0	1	0	0
Hipparchia_gomera	Nymphalidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	59.6	0	0.289	NA	NA	NA	NA	NA	NA	NA	200	1000	5.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_maderensis	Nymphalidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	44.8	NA	0	0	1	0	0	NA	NA	NA	800	1000	3.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_miguelensis	Nymphalidae	NA	5	5	NA	NA	NA	NA	1.00	0.0	1.00	0.0	41.6	1.00	NA	NA	NA	NA	NA	NA	NA	NA	600	400	4.00	1	0	1	0	0	0	0
Hipparchia_neapolitana	Nymphalidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	NA	NA	0.408	NA	NA	NA	NA	NA	NA	NA	800	300	3.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_tamadabae	Nymphalidae	NA	5	5	NA	NA	NA	NA	1.00	0.0	1.00	0.0	55.5	0.289	NA	NA	NA	NA	NA	NA	NA	NA	400	1600	6.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_wyssii	Nymphalidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	59.6	0	0.289	1	1	0	0	NA	NA	NA	1400	600	3.00	NA	NA	NA	NA	NA	NA	NA
Kretania_sephirus	Lycaenidae	NA	5	5	0	1	0	0	1.00	0.0	1.00	0.0	31.6	0	0.577	NA	NA	NA	NA	1	0	0	1000	1600	NA	1	0	0	0	0	0	0

species	families																																
Leptidea_reali	Pieridae	NA	5	5	0	0	1	0	2.00	1.0	3.0	2.0	38.0	10	1.00	0	0	1	0	0	1	0	0	0	200	6.04	0	0	1	1	1	1	1
Lycaena_candens	Lycaenidae	NA	5	5	0	1	0	0	1.00	1.0	1.0	0.0	34.5	1	1.00	0	1	0	0	0	1	1	0	900	150	3.051	1	0	0	0	0	0	0
Maniola_cypricola	Nymphalidae	NA	5	5	0	1	0	0	1.00	1.0	1.0	0.0	NA	NA	0.28	89	1	1	0	0	1	1	0	NA	NA	4.00	1	0	1	0	0	0	0
Pararge_xiphioides	Nymphalidae	NA	5	5	1	1	1	1	3.00	3.0	3.0	0.0	37.5	1	0.10	02	1	1	0	0	1	0	0	0	200	12.00	0	0	1	1	1	0	0
Pieris_balcana	Pieridae	NA	5	5	0	0	1	0	2.50	2.0	3.0	1.0	38.5	13	0.28	89	NA	NA	NA	NA	NA	NA	NA	0	100	7.00	1	0	0	0	0	0	0
Pontia_edusa	Pieridae	NA	5	5	0	0	1	0	3.00	3.0	3.0	0.0	41.7	5	0.10	02	1	0	0	0	1	0	0	0	300	5.053	1	0	0	0	0	0	0
Pyrgus_malvoides	Hesperiidae	NA	5	5	0	0	1	0	1.50	1.0	2.0	1.0	23.6	0	NA	0	1	1	0	0	1	0	0	0	180	3.053	1	0	0	0	0	0	1
Thymelicus_christi	Hesperiidae	NA	5	5	0	1	0	0	2.50	2.0	3.0	1.0	24.0	4	NA	0	0	1	0	0	NA	NA	NA	100	900	9.00	NA	NA	NA	NA	NA	NA	NA
Vanessa_cardui	Nymphalidae	NA	5	1	1	1	1	1	3.00	3.0	3.0	0.0	57.6	0	0.28	89	0	1	0	0	1	0	0	0	150	12.00	1	0	0	0	0	0	0
Zerynthia_cassandra	Papilionidae	44	NA	NA	0	0	1	0	1.00	1.0	1.0	0.0	49.6	0	0.50	77	0	1	0	0	1	1	0	0	170	4.00	1	0	0	0	0	0	0
Zizeeria_knysna	Lycaenidae	39	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.4	0	0.10	55	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1
Danaus_plexippus	Nymphalidae	38	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	70.2	0	0.35	54	0	1	0	0	NA	NA	NA	0	110	10.35	1	0	0	0	0	0	0
Cacyreus_marshalli	Lycaenidae	33	NA	NA	0	1	1	0	3.00	3.0	3.0	0.0	23.5		1.00	NA	NA	NA	NA	NA	1	0	0	0	150	8.00	1	0	0	0	0	0	0

species	family	[illegible]	conservation [illegible]	conservation [illegible]	OWS [illegible]	OWS [illegible]	OWS [illegible]	OWS [illegible]	GEN_Average [illegible]	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_single[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	AFB_honey[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	AFB_min[illegible]flower
Pyrgus_foulquieri	Hesperiidae	29	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	28.5	3	0.50	NA	NA	NA	NA	NA	NA	NA	NA	100	700	3.02	1	0	0	0	0	0	0
Kretania_pylaon	Lycaenidae	16	4	NA	0	1	0	0	1.00	1.0	1.0	0.0	29.5	3	1.00	0	0	1	0	0	1	0	0	0	800	2.00	1	0	0	0	0	0	0
Danaus_plexippus	Nymphalidae	15	NA	NA	0	0	0	1	3.00	3.0	3.0	0.0	95.5	13	0.50	0	0	1	0	0	1	0	0	0	400	11.2	1	0	1	0	0	0	0
Vanessa_virginiensis	Nymphalidae	12	NA	NA	NA	NA	NA	NA	3.00	3.0	3.0	0.0	45.0	10	0.048	0	1	0	0	1	0	0	0		1500	10.0	NA	NA	NA	NA	NA	NA	NA
Coenonympha_orientalis	Nymphalidae	11	3	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	30.5	3	0.50	NA	NA	NA	NA	NA	NA	NA	NA	800	1200	3.00	NA	NA	NA	NA	NA	NA	NA
Colotis_evagore	Pieridae	10	NA	NA	0	0	1	0	3.00	3.0	3.0	0.0	33.0	6	0.707	0	1	0	0	1	0	0	0		400	9.00	1	0	1	0	0	0	0
Hipparchia_blachieri	Nymphalidae	9	NA	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	52.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1900	4.53	NA	NA	NA	NA	NA	NA	NA
Kretania_trappi	Lycaenidae	6	4	NA	0	1	0	0	1.00	1.0	1.0	0.0	31.0	6	0.707	1	1	0	0	NA	NA	NA		1000	1000	3.00	NA	NA	NA	NA	NA	NA	NA
Lycaena_thetis	Lycaenidae	6	NA	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	27.5	1	0.707	NA	NA	NA	NA	NA	NA	NA	NA	1500	800	2.00	1	0	0	0	0	0	0
Pseudochazara_mercurius	Nymphalidae	6	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	50.0	4	1.00	NA	NA	NA	NA	NA	NA	NA	NA	1400	1300	2.00	1	0	0	0	0	0	0
Proterebia_phegea	Nymphalidae	5	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	46.0	4	1.00	0	1	1	0	0	1	1	0	150	1450	2.51	1	0	0	0	0	0	0
Pseudochazara_williamsi	Nymphalidae	5	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	50.0	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	2000	700	3.00	1	0	0	0	0	0	1

species	families	range	conservation	conservation	OWS	OWS	OWS_egg	OWS	GEN_Average	GEN	GEN	GEN	WSP_Female_average	WSP_Fe	ELT	ELT	ELT	ELT_single	ELT	ELT	ELT	ALT	ALT	FM_Average	AFB	AFB	AFB	AFB	AFB_honey	AFB_anim	AFB_min_flower
Hipparchia_mersina	Nymphalidae	3	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	51.06	0.289	NA	NA	NA	NA	NA	NA	NA	0	1300	4.53	0	0	0	0	0	1	1
Plebejidea_loewii	Lycaenidae	3	NA	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	28.53	0.707	NA	NA	NA	NA	NA	NA	NA	0	3000	3.51	1	0	0	0	0	0	0
Carcharodus_stauderi	Hesperiidae	2	NA	NA	NA	NA	NA	NA	3.00	3.0	3.0	0.0	30.04	0.289	NA	NA	NA	NA	NA	NA	NA	700	1700	8.00	NA	NA	NA	NA	NA	NA	NA
Kretania_eurypilus	Lycaenidae	2	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	29.53	0.447	0	1	0	0	NA	NA	NA	1000	1200	2.00	NA	NA	NA	NA	NA	NA	NA
Maniola_megala	Nymphalidae	2	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	41.59	0.289	1	1	0	0	1	1	0	0	900	3.53	1	0	1	0	0	0	0
Polyommatus_iphigenia	Lycaenidae	2	NA	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	30.04	1.00	NA	NA	NA	NA	NA	NA	NA	500	2300	2.51	NA	NA	NA	NA	NA	NA	NA
Pseudochazara_cingovskii	Nymphalidae	2	1	NA	0	1	0	0	1.00	1.0	1.0	0.0	52.04	0.577	NA	NA	NA	NA	NA	NA	NA	1000	2000	2.00	NA	NA	NA	NA	NA	NA	NA
Ypthima_asterope	Nymphalidae	2	NA	NA	0	1	0	0	3.00	3.0	3.0	0.0	30.04	0.500	0	1	0	0	1	0	0	0	1200	7.51	1	0	0	0	0	0	0
Borbo_borbonica	Hesperiidae	1	NA	NA	0	1	0	0	2.50	2.0	3.0	1.0	29.02	0.333	1	1	0	0	1	0	0	0	1000	4.51	1	0	0	0	0	0	0
Pelopidas_thrax	Hesperiidae	1	NA	NA	0	1	1	0	3.00	3.0	3.0	0.0	39.5	0.218	0	1	0	0	1	0	0	500	1500	10.40	1	0	0	0	0	0	0

species	families	conservation			OWS	OWS_larva	OWS_pupa	OWS_egg	GEN_Average				WSP_Female_average	WSP_Female								ELT_single				FM_Average						AFB_honey	AFB	AFB_mineral
Satyrium_ederi	Lycaenidae		NA	NA	1	0	0	0	1.00	1.0	1.0	0.0	29.0	4	0.5077		0	0	1	0	1	0	0	600	1900	3.05	3	1	0	0	0	0	0	0
Aglais_nusia	Nymphalidae	NA	NA	NA	0	0	0	1	2.00	2.0	2.0	0.0	47.0	10	0.577	NA	NA	NA	NA	NA	NA	NA	NA	700	1800	8.00		1	0	0	0	0	0	0
Azanus_jesous	Lycaenidae	NA	NA	NA	NA	NA	NA	NA	3.00	3.0	3.0	0.0	21.5	1	0.289	NA	NA	NA	NA	NA	1	0	0	0	1800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Azanus_ubaldus	Lycaenidae		NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	12.5		0.5077		0	0	1	0	1	1	0	0	1500	NA	NA	0	0	1	0	0	0	0
Catopsilia_florella	Pieridae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	50.0	10	NA	0	0	0	1	1	1	1	0	0	2000	11.2	0	NA	NA	NA	NA	NA	NA	NA
Hipparchia_autonoe	Nymphalidae	NA	5	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	54.0	8	0.102	NA	NA	NA	NA	NA	1	0	0	0	1600	2.00		1	0	1	0	0	1	0
Iolana_bilitata	Lycaenidae	NA	NA	NA	0	0	1	0	1.50	0.5	1.5	0.0	39.0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	800	1300	5.00		1	0	0	0	0	0	0
Iphiclides_feisthamelii	Papilionidae	NA	NA	NA	0	0	1	0	3.00	3.0	3.0	0.0	77.0	26	0.408		0	0	1	0	1	0	0	0	2700	7.51		1	0	0	0	0	0	0
Leptidea_juvernica	Pieridae	NA	NA	NA	0	0	1	0	1.00	1.0	1.0	0.0	42.0		NA	0	0	1	0	0	1	0	0	NA	NA	3.00		1	0	1	0	0	0	0
Luthrodes_galba	Lycaenidae	NA	NA	NA	NA	NA	NA	NA	3.00	3.0	3.0	0.0	20.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lysandra_corydonius	Lycaenidae	NA	5	NA	0	1	0	0	1.00	1.0	1.0	0.0	33.0	6	NA	0	1	1	0	0	1	0	0	0	2900	3.00		1	0	0	0	0	0	0
Melanargia_celadussa	Nymphalidae	NA	NA	NA	0	1	0	0	1.50	0.0	2.0	1.0	35.5	9	0.102	NA	NA	NA	NA	NA	NA	NA	NA	0	2600	3.00	2	1	0	0	0	0	0	1

species	families	range.size	conserv.eu	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Melitaea_ornata	Nymphalidae	NA	NA	NA	0	1	0	0	1.00	1.0	1.0	0.0	41.5	7	0.289	[illegible]	0	1	0	0	0	0	1	0	1900	4.00	0	1	0	0	0	0	0	0
Polyommatus_celina	Lycaenidae	NA	NA	NA	0	1	0	0	4.00	4.0	4.0	0.0	27.0	12	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	2800	11.00	0	1	0	0	0	0	0	1
Polyommatus_damocles	Lycaenidae	NA	NA	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	31.5		NA	NA	NA	NA	NA	NA	NA	NA	NA	1700	3000	2.51		NA	NA	NA	NA	NA	NA	NA
Pseudochazara_euxina	Nymphalidae	NA	2	NA	NA	NA	NA	NA	1.00	1.0	1.0	0.0	54.5	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	700	3.00		NA	NA	NA	NA	NA	NA	NA
Spialia_ca[illegible]	Lycaenidae	NA	NA	NA	NA	NA	NA	NA	3.00	3.0	3.0	0.0	20.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1400	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tomares_callimachus	Lycaenidae	NA	5	NA	0	0	1	0	1.00	1.0	1.0	0.0	28.0	4	NA	1	1	1	0	0	1	0	0	0	2300	3.00	0	NA	NA	NA	NA	NA	NA	NA
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	1	1	1	1	3.00	3.0	3.0	0.0	22.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA	NA

4.6 Select columns with `select()`

```r
# 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_ichnusa	NA	NA	8.0	47.0

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_zullichi	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_Average	WSP_Female_average
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_Average	WSP_Female_average
Coenonympha_rhodopensis	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_lorquinii	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
Cyclyrius_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_Average	WSP_Female_average
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_sthennyo	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_charlonia	NA	5	8.5	34.0
Euchloe_crameri	197	5	3.0	44.0

species	range.size	conserv.eu	FM_Average	WSP_Female_average
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_Average	WSP_Female_average
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_cribrellum	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_antiopa	910	5	5.5	67.5
Nymphalis_polychloros	845	3	6.5	62.0
Nymphalis_vaualbum	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_Average	WSP_Female_average
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_nephohiptamenos	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_Average	WSP_Female_average
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_Average	WSP_Female_average
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

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

species	family	range.size	conserv.eu	[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Female_[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_single_[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	[illegible]	AFB_honey_[illegible]	AFB_anim[illegible]	AFB_min[illegible]_flower
Aglais_ichnusa	Nymphalidae	NA	NA	NA	2.00	2.0	2.0	0.0	47.0	10	0.577	NA	NA	NA	NA	NA	NA	NA	NA	700	1800	8.00	1	0	0	0	0	0	0
Aglais_io	Nymphalidae	1136	[illegible]	5	2.00	1.0	3.0	2.0	53.5	17	0.236	[illegible]	0	1	0	0	0	0	1	0	2500	7.53	1	0	1	0	0	1	1
Aglais_urticae	Nymphalidae	1271	[illegible]	5	2.00	1.0	3.0	2.0	48.0	10	0.707	[illegible]	0	1	0	0	0	0	1	0	3000	7.53	1	0	1	0	0	1	1
Agriades_aquilo	Lycaenidae	21	5	5	0.75	0.5	1.0	0.5	23.0	2	0.289	[illegible]	0	1	0	0	NA	NA	NA	0	900	3.00	NA	NA	NA	NA	NA	NA	NA
Agriades_[illegible]danus	Lycaenidae	2	4	4	1.00	1.0	1.0	0.0	25.0	6	0.577	NA	NA	NA	NA	NA	NA	NA	NA	800	3400	4.00	NA	NA	NA	NA	NA	NA	NA
Agriades_glandon	Lycaenidae	45	5	5	1.00	1.0	1.0	0.0	23.0	2	0.354	[illegible]	0	1	0	0	NA	NA	NA	1600	1100	2.00	1	0	0	0	0	0	0

species	family	range			GEN_Average				WSP_Female_average													FM_Average							
Agriades_optilete	Lycaenidae	480	5	5	1.00	1.0	1.0	0.0	25.0	8	0.2018		1	1	0	0	1	0	0	0	2800	3.00	1	0	1	0	0	1	0
Agriades_orbitulus	Lycaenidae	63	5	5	1.00	1.0	1.0	0.0	26.0	4	0.258	NA	NA	NA	NA	NA	1	0	0	800	1900	3.00	0	0	0	0	0	0	1
Agriades_pyrenaicus	Lycaenidae	5	5	5	1.00	1.0	1.0	0.0	25.0	6	1.0000		1	0	0	0	1	0	0	1800	400	NA NA	1	0	0	0	0	0	1
Agriades_zullichi	Lycaenidae	2	2	2	1.00	1.0	1.0	0.0	23.5	3	1.0100		1	1	0	0	1	0	0	2400	600	3.00	1	0	0	0	0	0	0
Anthocharis_cardamines	Pieridae	124	5	5	1.00	1.0	1.0	0.0	40.5	15	0.1011		0	1	0	0	1	0	0	0	2300	4.02	1	0	0	0	0	0	0
Anthocharis_damone	Pieridae	19	5	5	1.00	1.0	1.0	0.0	39.5	5	1.00	NA	NA	NA	NA	NA	1	0	0	0	1300	3.02	1	0	0	0	0	0	0
Anthocharis_euphenoides	Pieridae	131	5	5	1.00	1.0	1.0	0.0	37.0	6	0.577		0	1	0	0	1	0	0	0	1800	3.51	1	0	0	0	0	0	0
Anthocharis_gruneri	Pieridae	36	5	5	1.00	1.0	1.0	0.0	33.0	6	0.408	NA	NA	NA	NA	NA	1	0	0	0	2300	4.04	1	0	0	0	0	0	0
Apatura_ilia	Nymphalidae	528	5	5	1.50	1.0	2.0	1.0	68.0	8	0.267		0	0	1	1	1	0	0	50	1850	4.53	1	0	0	1	1	1	1
Apatura_iris	Nymphalidae	571	5	5	1.00	1.0	1.0	0.0	70.0	10	0.316		0	0	1	0	1	0	0	0	2300	2.51	1	0	0	1	1	1	1
Apatura_metis	Nymphalidae	47	5	5	1.50	1.0	2.0	1.0	62.0	4	1.0000		0	0	1	1	1	0	0	0	650	4.00	1	0	1	1	1	1	1

species	family	range_size	conservation	conservation	GEN_Average				WSP_Female_average	WSP_Female_range									ELT_single		FM_Average				AFB_honey		AFB_an	AFB_minflower
Aphantopus_hyperantus	Nymphalidae	100	2	5	1.00	1.0	1.0	0.0	38.5	7	0.063	1	1	0	0	1	1	0	0	2000	3.00	1	0	1	0	0	0	0
Aporia_crataegi	Pieridae	894	5	5	1.00	1.0	1.0	0.0	62.5	11	0.082	0	1	1	0	0	0	1	0	2600	3.51	1	1	0	1	0	0	1
Araschnia_levana	Nymphalidae	626	5	5	2.00	1.0	3.0	2.0	33.5	11	0.707	0	1	0	0	0	1	1	0	1700	5.02	1	0	1	0	0	0	0
Archon_apollinus	Papilionidae	13	4	5	1.00	1.0	1.0	0.0	57.0	6	0.577	0	1	0	0	0	1	0	0	900	3.53	1	0	0	0	0	0	0
Arethusana_arethusa	Nymphalidae	229	5	5	1.00	1.0	1.0	0.0	41.0	6	0.333	1	1	0	0	0	1	0	0	2300	3.51	1	0	0	0	0	0	0
Argynnis_laodice	Nymphalidae	100	5	4	1.00	1.0	1.0	0.0	55.0	10	0.707	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.00	0	0	1	0	0	0	1
Argynnis_pandora	Nymphalidae	320	5	5	1.50	1.0	2.0	1.0	72.0	16	0.577	1	1	0	0	1	0	0	0	2600	5.04	1	0	0	0	0	1	1
Argynnis_paphia	Nymphalidae	102	4	5	1.00	1.0	1.0	0.0	62.0	8	0.258	0	1	0	0	1	0	0	0	2300	4.02	1	0	1	1	0	0	1
Aricia_agestis	Lycaenidae	700	5	5	2.00	1.0	3.0	2.0	25.0	6	0.102	1	1	0	0	1	0	0	0	1900	7.00	1	0	0	0	0	1	1
Aricia_cramera	Lycaenidae	43	4	5	2.00	1.0	3.0	2.0	28.0	8	0.289	0	1	0	0	1	0	0	300	2100	5.00	1	0	0	0	0	0	0
Aricia_artaxerxes	Lycaenidae	435	5	5	1.00	1.0	1.0	0.0	27.5	7	0.056	1	1	0	0	1	0	0	0	2200	4.00	1	0	0	0	0	0	0

species	family	range	con-serv…	con…	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe…	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin…	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	AFB_honey…	AFB_an…	AFB_min…
Aricia_cramera	Lycaenidae	138	5	5	2.50	2.0	3.0	1.0	25.0	6	0.102	1	1	1	0	0	1	0	0	0	2500	0.55		1	0	0	0	0	0	1
Aricia_montensis	Lycaenidae	32	5	5	1.00	1.0	1.0	0.0	27.5	7	0.183	NA	NA	NA	NA	NA	NA	NA	NA	0	2800	4.00		1	0	0	0	0	0	1
Aricia_morronensis	Lycaenidae	15	5	5	1.50	1.0	2.0	1.0	28.0	4	0.507	7	0	1	0	0	1	0	0	900	2100	4.00		1	0	0	0	0	0	0
Aricia_nicias	Lycaenidae	78	5	5	1.00	1.0	1.0	0.0	25.5	5	0.707	0	0	1	0	0	1	0	0	0	300	2.00		1	0	0	0	0	0	0
Azanus_jesous	Lycaenidae	NA	NA	NA	3.00	3.0	3.0	0.0	21.5	1	0.289	NA	NA	NA	NA	NA	1	0	0	0	1800	NA	NA	NA	NA	NA	NA	NA	NA	NA
Azanus_ubaldus	Lycaenidae	NA	NA	NA	3.00	3.0	3.0	0.0	12.5	5	0.507	7	0	0	1	0	1	1	0	0	1500	NA	NA	0	0	1	0	0	0	0
Boloria_aquilonaris	Nymphalidae	4785	5	5	1.00	1.0	1.0	0.0	36.0	8	0.289	8	1	1	0	0	1	0	0	100	1900	2.02		1	0	1	0	0	0	0
Boloria_chariclea	Nymphalidae	2244	4	4	1.00	1.0	1.0	0.0	38.0	8	0.354	NA	NA	NA	NA	NA	NA	NA	NA	100	1300	1.51		1	0	0	0	0	0	0
Boloria_dia	Nymphalidae	5545	5	5	2.00	1.0	3.0	2.0	33.0	2	0.407	4	0	1	0	0	1	0	0	0	2000	5.53		1	0	0	0	0	0	0
Boloria_eunomia	Nymphalidae	3115	5	5	1.00	1.0	1.0	0.0	36.5	7	0.183	0	0	1	0	0	1	1	0	50	1850	3.00		1	0	0	0	0	0	0
Boloria_euphrosyne	Nymphalidae	9635	5	5	1.50	1.0	2.0	1.0	36.0	10	0.507	7	0	1	0	0	1	0	0	0	2300	4.04		1	0	0	0	0	0	0
Boloria_freija	Nymphalidae	1445	5	5	1.00	1.0	1.0	0.0	34.5	11	0.158	6	0	0	1	0	1	0	0	200	800	2.51		1	0	0	0	0	0	0

species	family	range	conservation		GEN_Average				WSP_Female_average	WSP_Female_range	HSI					ELT_single					FM_Average				AFB_honey		AFB_mineral	AFB_flower
Boloria_frigga	Nymphalidae	145	5	5	1.00	1.0	1.0	0.0	42.5	11	0.707	0	0	1	0	1	0	0	100	350	2.00	1	0	0	0	0	0	0
Boloria_graeca	Nymphalidae	37	5	5	1.00	1.0	1.0	0.0	36.0	8	1.000	0	1	0	0	1	0	0	750	1850	4.02	1	0	0	0	0	0	0
Boloria_improba	Nymphalidae	6	2	2	1.00	1.0	1.0	0.0	32.5	7	0.500	0	1	0	0	NA	NA	NA	600	450	2.02	1	0	0	0	0	0	0
Boloria_napaea	Nymphalidae	112	5	5	1.00	1.0	1.0	0.0	39.0	6	0.354	1	1	0	0	1	0	0	0	2500	3.00	1	0	0	0	0	0	0
Boloria_pales	Nymphalidae	101	5	5	1.00	1.0	1.0	0.0	36.0	8	0.258	0	1	0	0	1	0	0	1500	1600	3.02	1	0	0	0	0	0	0
Boloria_polaris	Nymphalidae	18	3	3	1.00	1.0	1.0	0.0	41.5	5	0.204	NA	NA	NA	NA	1	0	0	100	1300	2.53	NA	NA	NA	NA	NA	NA	NA
Boloria_selene	Nymphalidae	98	5	5	1.50	1.0	2.0	1.0	36.5	7	0.577	0	1	0	0	1	0	0	0	2200	3.53	1	0	0	0	0	0	1
Boloria_thore	Nymphalidae	79	5	5	1.25	1.0	1.5	1.0	44.0	6	0.577	0	1	0	0	1	0	0	300	1500	2.02	1	0	0	0	0	0	0
Boloria_titania	Nymphalidae	141	4	5	1.00	1.0	1.0	0.0	39.5	9	0.500	0	1	0	0	1	0	0	100	2000	3.00	1	0	0	0	0	0	0
Borbo_borbonica	Hesperiidae	1	NA	NA	2.50	2.0	3.0	1.0	29.0	2	0.333	1	1	0	0	1	0	0	0	100	4.51	1	0	0	0	0	0	0
Brenthis_daphne	Nymphalidae	323	5	5	1.00	1.0	1.0	0.0	47.0	10	0.447	0	0	1	0	1	0	0	0	2300	3.51	1	0	1	0	0	0	0
Brenthis_hecate	Nymphalidae	190	5	5	1.00	1.0	1.0	0.0	40.0	8	0.408	0	1	0	0	1	0	0	25	2275	3.00	1	0	0	0	0	0	0

species	family	range	conservation	conservation	GEN_Average	GEN_	GEN_	GEN_Range	WSP_Female_average	WSP_Fe	WSP_Fe	HSI	LEV	LEV	LEV	ELT_single	ELT_	ELT_	ELT_	ELT_	FM_Average	FM_	FM_	FM_	AFB_honey	AFB_	AFB_animal	AFB_minflower
Brenthis_ino	Nymphalidae	695	5	5	1.00	1.0	1.0	0.0	37.0	8	0.204	1	1	0	0	1	1	0	0	2000	2.51	1	0	1	0	0	0	0
Brintesia_circe	Nymphalidae	416	5	5	1.00	1.0	1.0	0.0	73.0	14	0.204	1	1	0	0	0	1	0	0	2300	4.53	1	0	0	0	1	1	1
Calycopis_marshalli	Lycaenidae	33	NA	NA	3.00	3.0	3.0	0.0	23.5	5	1.000	NA	NA	NA	NA	1	0	0	0	1500	8.00	1	0	0	0	0	0	0
Callophrys_avis	Lycaenidae	37	5	5	1.00	1.0	1.0	0.0	35.5	3	0.250	NA	NA	NA	NA	1	0	0	100	900	3.00	1	0	0	0	0	0	0
Callophrys_rubi	Lycaenidae	1192	5	5	1.25	1.0	1.5	0.5	23.0	6	0.033	1	1	1	0	1	0	0	0	2300	6.02	1	0	1	1	0	0	0
Carcharodus_alceae	Hesperiidae	615	5	5	2.50	2.0	3.0	1.0	30.0	8	0.167	0	1	0	0	1	0	0	0	3000	8.04	1	0	0	0	0	0	0
Carcharodus_baeticus	Hesperiidae	56	5	5	2.50	2.0	3.0	1.0	30.0	4	0.408	1	1	0	0	1	0	0	500	1100	4.04	1	0	0	0	0	0	1
Carcharodus_floccifera	Hesperiidae	277	4	5	1.50	1.0	2.0	1.0	30.0	4	0.174	0	1	0	0	1	0	0	0	2000	4.51	1	0	0	0	0	0	1
Carcharodus_lavatherae	Hesperiidae	146	4	4	1.00	1.0	1.0	0.0	31.0	6	0.408	1	1	0	0	1	0	0	0	1600	4.02	1	0	0	0	0	0	1
Carcharodus_orientalis	Hesperiidae	54	5	5	2.50	2.0	3.0	1.0	29.0	2	0.577	NA	NA	NA	NA	NA	NA	NA	0	2000	4.51	NA	NA	NA	NA	NA	NA	NA

species	family	range	con-serv-…	con-…	GEN_Av-er-age	GEN_…	GEN_…	GEN_…	WSP_Fe-male_av-er-age	WSP_Fe-…	…	…	…	…	…	…	ELT_sin-…	…	…	…	…	FM_Av-er-age	…	…	…	AFB_hon-ey-…	…	AFB_an-i-…	AFB_min-…
Carcharodus_stauderi	Hesperiidae	2	NA	NA	3.00	3.0	3.0	0.0	30.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	700	1700	8.00	NA	NA	NA	NA	NA	NA	NA
Carcharodus_tripolinus	Hesperiidae	NA	5	5	3.00	3.0	3.0	0.0	30.0	8	1.000	NA	NA	NA	NA	NA	NA	NA	NA	0	2500	7.00	NA	NA	NA	NA	NA	NA	NA
Carterocephalus_palaemon	Hesperiidae	585	5	5	1.00	1.0	1.0	0.0	27.0	6	0.126	[illegible]	0	1	0	0	1	0	0	0	1800	2.51	1	0	0	0	0	0	0
Carterocephalus_silvicola	Hesperiidae	222	5	5	1.00	1.0	1.0	0.0	25.0	6	0.200	[illegible]	0	1	0	0	1	0	0	0	500	2.51	1	0	0	0	0	0	0
Catopsilia_florella	Pieridae	NA	NA	NA	3.00	3.0	3.0	0.0	50.0	10	NA	0	0	0	1	1	1	1	0	0	2000	11.02	NA	NA	NA	NA	NA	NA	NA
Celastrina_argiolus	Lycaenidae	1190	5	5	1.75	1.0	2.5	1.5	27.0	10	0.020	[illegible]	0	0	1	1	1	0	0	0	1900	7.00	1	0	1	1	0	0	0
Charaxes_jasius	Nymphalidae	127[illegible]	5	5	1.50	1.0	2.0	1.0	79.5	7	0.102	[illegible]	0	0	0	1	1	1	0	0	2400	6.53	0	0	0	0	0	1	1
Chazara_briseis	Nymphalidae	353	4	4	1.00	1.0	1.0	0.0	55.0	26	0.333	[illegible]	1	1	0	0	1	1	0	0	2500	4.04	1	0	0	0	0	1	1
Chazara_prieuri	Nymphalidae	8	5	5	1.00	1.0	1.0	0.0	60.0	12	1.000	NA	NA	NA	NA	NA	NA	NA	NA	900	1100	2.00	1	0	0	0	0	0	0

species	family	range	conservation	popsize	GEN_Average	GEN_Min	GEN_Max	GEN_Range	WSP_Female_average	WSP_Female_range	HSI					ELT_single					FM_Average				AFB_honey		AFB_an	AFB_min flower
Coenonympha_arcania	Nymphalidae	736	5	5	1.25	1.0	1.5	0.5	37.0	6	0.169	0	1	0	0	1	1	0	0	2300	3.53	1	0	1	0	0	0	0
Coenonympha_corinna	Nymphalidae	17	5	5	2.25	1.5	3.0	1.5	29.0	2	0.57	NA	NA	NA	NA	1	0	0	0	2000	4.51	1	0	0	0	0	0	0
Coenonympha_dorus	Nymphalidae	107	5	5	1.00	1.0	1.0	0.0	31.0	6	0.169	0	1	0	0	1	0	0	100	1600	3.00	1	0	0	0	0	1	0
Coenonympha_gardetta	Nymphalidae	61	5	5	1.00	1.0	1.0	0.0	31.0	2	0.57	NA	NA	NA	NA	1	1	0	800	2200	4.00	1	0	0	0	0	0	0
Coenonympha_glycerion	Nymphalidae	574	5	5	1.50	1.0	2.0	1.0	28.0	6	0.258	0	1	0	0	1	0	0	200	2200	3.00	1	0	0	0	0	1	0
Coenonympha_hero	Nymphalidae	173	3	3	1.00	1.0	1.0	0.0	30.0	4	0.154	0	1	0	0	1	0	0	0	800	3.53	1	0	1	0	0	0	0
Coenonympha_leander	Nymphalidae	27	5	5	1.00	1.0	1.0	0.0	33.0	2	0.500	0	1	0	0	1	0	0	0	2100	3.53	1	0	0	0	0	0	0
Coenonympha_oedippus	Nymphalidae	52	2	5	1.00	1.0	1.0	0.0	38.0	8	0.258	0	1	0	0	1	0	0	0	500	3.00	1	0	1	1	0	0	0
Coenonympha_orientalis	Nymphalidae	11	3	NA	1.00	1.0	1.0	0.0	30.5	3	0.500	NA	NA	NA	NA	NA	NA	NA	800	1200	3.00	NA	NA	NA	NA	NA	NA	NA
Coenonympha_pamphilus	Nymphalidae	137	7	5	2.00	1.0	3.0	2.0	28.0	10	0.096	0	1	0	0	1	0	0	0	2700	7.06	1	0	0	0	0	0	0
Coenonympha_rhodopensis	Nymphalidae	39	5	5	1.00	1.0	1.0	0.0	33.0	2	0.354	0	1	0	0	1	0	0	750	1750	2.51	1	0	0	0	0	0	0
Coenonympha_thyrsis	Nymphalidae	9	5	5	2.00	1.0	3.0	2.0	32.0	14	0.289	0	1	0	0	NA	NA	NA	0	1800	5.04	1	0	0	0	0	0	0

species	family	range	conservation	conservation_group	GEN_Average	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	[illegible]	AFB_ani[illegible]	AFB_min[illegible]
Coenonympha_tullia	Nymphalidae	[illegible]	[illegible]	[illegible]	1.00	1.0	1.0	0.0	31.5	11	0.1015	0	1	0	0	1	0	0	0	1400	2.02	1	0	1	0	0	0	0
Colias_alfacariensis	Pieridae	494	5	5	2.50	2.0	3.0	1.0	43.5	3	0.1667	1	1	0	0	1	0	0	0	2600	6.51	1	0	0	0	0	0	0
Colias_aurorina	Pieridae	14	5	5	1.00	1.0	1.0	0.0	55.0	2	0.5077	0	1	0	0	1	0	0	450	1950	5.00	0	0	1	0	0	0	0
Colias_caucasica	Pieridae	13	5	5	1.00	1.0	1.0	0.0	52.0	4	0.7007	0	1	0	0	1	0	0	900	1400	3.00	1	0	0	0	0	0	0
Colias_chrysotheme	Pieridae	36	3	3	2.50	2.0	3.0	1.0	44.0	8	0.4008	1	1	0	0	1	0	0	0	1500	7.00	1	0	0	0	0	0	0
Colias_crocea	Pieridae	1028	[illegible]	5	3.00	3.0	3.0	0.0	48.0	12	0.0041	0	1	0	0	1	0	0	0	3000	7.04	1	0	0	0	0	0	1
Colias_erate	Pieridae	138	5	5	2.50	2.0	3.0	1.0	49.0	6	0.1133	NA	NA	NA	NA	1	0	0	0	2000	4.51	NA	NA	NA	NA	NA	NA	NA
Colias_hecla	Pieridae	24	4	4	1.00	1.0	1.0	0.0	43.0	8	0.1077	1	0	0	0	1	1	0	0	900	3.00	1	0	0	0	0	0	0
Colias_hyale	Pieridae	682	5	5	2.50	2.0	3.0	1.0	45.0	10	0.2004	1	1	0	0	1	0	0	0	1800	6.51	1	0	0	0	0	0	0

species	family	range	conservation	con...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	AFB_honey...	AFB_an...	AFB_min...	AFB_flower
Colias_myrmidone	Pieridae	94	2	1	2.50	2.0	3.0	1.0	47.0	6	0.316	0	1	0	0	1	0	0	0	500	5.51	1	0	0	0	0	0	0
Colias_palaeno	Pieridae	417	5	5	1.00	1.0	1.0	0.0	47.0	10	0.707	1	1	0	0	1	0	0	0	2500	3.00	1	0	1	0	0	0	0
Colias_phicomone	Pieridae	83	4	4	1.25	1.0	1.5	0.5	45.0	10	0.169	1	0	0	0	1	0	0	900	1600	0.51	1	0	0	0	0	0	0
Colias_tyche	Pieridae	6	5	5	1.00	1.0	1.0	0.0	45.0	10	0.289	1	0	0	0	1	0	0	0	700	3.00	1	0	0	0	0	0	0
Colotis_evagore	Pieridae	10	NA	NA	3.00	3.0	3.0	0.0	33.0	6	0.707	0	1	0	0	1	0	0	0	400	9.00	1	0	1	0	0	0	0
Cupido_alcetas	Lycaenidae	146	5	5	2.50	2.0	3.0	1.0	29.0	6	0.183	0	1	0	0	1	0	0	0	1000	7.00	1	0	0	0	0	0	0
Cupido_argiades	Lycaenidae	478	5	5	2.00	2.0	2.0	0.0	29.0	2	0.072	0	1	0	0	1	0	0	0	1600	6.00	1	0	0	0	0	0	0
Cupido_decoloratus	Lycaenidae	67	4	5	2.50	2.0	3.0	1.0	25.0	2	0.258	0	1	0	0	NA	NA	NA	0	1200	5.00	1	0	0	0	0	0	0
Cupido_lorquinii	Lycaenidae	17	5	5	1.00	1.0	1.0	0.0	25.0	6	1.000	0	1	0	0	NA	NA	NA	100	1900	3.00	1	0	0	0	0	0	1
Cupido_minimus	Lycaenidae	753	5	5	1.50	1.0	2.0	1.0	23.0	4	0.105	0	1	0	0	1	0	0	0	2800	6.00	1	0	0	0	0	1	1
Cupido_osiris	Lycaenidae	131	5	5	1.50	1.0	2.0	1.0	27.0	6	0.289	0	1	0	0	1	0	0	200	1800	6.00	1	0	0	0	0	0	1

species	family	range	con-serv…	con…	GEN_Average	GEN_…	GEN_…	GEN_…	WSP_Female_average	WSP_Fe…	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin…	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_…	AFB_…ey…	AFB_…i…	AFB_min… / …lower
Cyaniris_semiargus	Lycaenidae	930	5	5	1.25	1.0	1.5	0.5	29.0	8	0.169	0	1	0	0	1	0	0	0	2400	6.00	1	0	0	0	0	0	0
Cyclyrius_webbianus	Lycaenidae	NA	5	5	3.00	3.0	3.0	0.0	27.5	5	0.289	0	1	0	0	0	1	0	200	330	NA NA	1	0	0	0	0	0	0
Danaus_chrysippus	Nymphalidae	38	NA	NA	3.00	3.0	3.0	0.0	70.0	20	0.354	0	1	0	0	NA	NA	NA	0	1100	10.53	1	0	0	0	0	0	0
Danaus_plexippus	Nymphalidae	15	NA	NA	3.00	3.0	3.0	0.0	95.5	13	0.500	0	1	0	0	1	0	0	0	400	11.02	1	0	1	0	0	0	0
Erebia_aethiopella	Nymphalidae	10	5	5	1.00	1.0	1.0	0.0	38.0	4	1.000	NA	NA	NA	NA	NA	NA	NA	1800	800	2.00	NA	NA	NA	NA	NA	NA	NA
Erebia_aethiops	Nymphalidae	326	5	5	1.00	1.0	1.0	0.0	47.0	10	0.043	1	1	0	0	1	0	0	0	2000	3.51	1	0	0	0	0	0	0
Erebia_albergana	Nymphalidae	65	5	5	1.00	1.0	1.0	0.0	43.0	6	0.333	NA	NA	NA	NA	NA	NA	NA	900	1300	3.00	1	0	0	0	0	0	1
Erebia_calcarius	Nymphalidae	9	5	5	1.00	1.0	1.0	0.0	38.0	4	0.500	NA	NA	NA	NA	NA	NA	NA	1600	0	3.00	1	0	0	0	0	0	0
Erebia_cassioides	Nymphalidae	65	5	5	1.00	1.0	1.0	0.0	37.0	6	1.000	1	1	0	0	1	0	0	1500	1100	3.02	1	0	0	0	0	0	1
Erebia_christi	Nymphalidae	1	3	3	0.50	0.5	0.5	0.0	38.0	4	1.000	NA	NA	NA	NA	NA	NA	NA	1300	800	2.51	1	0	0	0	0	0	1
Erebia_claudina	Nymphalidae	8	4	4	0.75	0.5	1.0	0.5	35.0	2	0.500	0	1	0	0	NA	NA	NA	1400	900	3.02	1	0	0	0	0	0	0

species	family								GEN_Average		WSP_Female_average	WSP_Fe[illegible]						ELT_sin[illegible]				FM_Average				AFB_honey[illegible]	AFB_ani[illegible]	AFB_min[illegible]	AFB_flower
Erebia_disa	Nymphalidae	36	5	5	0.50	0.5	0.5	0.0	45.5	7	0.577	NA	NA	NA	NA	NA	NA	NA	NA	300	200	2.00	NA	NA	NA	NA	NA	NA	NA
Erebia_embla	Nymphalidae	123	5	5	1.00	1.0	1.0	0.0	47.5	7	0.224	0	0	1	0	0	NA	NA	NA	100	300	2.00	NA	NA	NA	NA	NA	NA	NA
Erebia_epiphron	Nymphalidae	137	5	5	0.75	0.5	1.0	0.5	38.0	8	0.224	0	0	1	0	0	1	0	0	350	2350	2.51	1	0	0	0	0	0	0
Erebia_epistygne	Nymphalidae	24	4	4	1.00	1.0	1.0	0.0	47.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	NA	400	1150	3.00	1	0	0	0	0	0	0
Erebia_eriphyle	Nymphalidae	34	5	5	0.50	0.5	0.5	0.0	34.0	4	0.500	0	0	1	0	0	NA	NA	NA	1200	1050	3.00	1	0	0	0	0	0	0
Erebia_euryale	Nymphalidae	203	5	5	0.75	0.5	1.0	0.5	44.0	4	0.096	0	0	1	0	0	1	0	0	600	1900	3.02	1	0	0	0	0	0	0
Erebia_flavofasciata	Nymphalidae	5	4	4	0.50	0.5	0.5	0.0	35.0	2	1.000	NA	NA	NA	NA	NA	1	0	0	1800	800	3.00	1	0	0	0	0	0	0
Erebia_gorge	Nymphalidae	92	5	5	0.50	0.5	0.5	0.0	37.0	6	0.316	0	0	1	0	0	NA	NA	NA	1600	1500	3.00	NA	NA	NA	NA	NA	NA	NA
Erebia_gorgone	Nymphalidae	13	5	5	1.00	1.0	1.0	0.0	41.0	2	0.577	NA	NA	NA	NA	NA	NA	NA	NA	1500	950	2.00	1	0	0	0	0	0	0
Erebia_hispanica	Nymphalidae	17	5	5	1.00	1.0	1.0	0.0	38.0	8	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1650	1250	2.51	1	0	0	0	0	0	1
Erebia_lefebvrei	Nymphalidae	12	5	5	1.00	1.0	1.0	0.0	44.0	8	0.707	NA	NA	NA	NA	NA	1	0	0	1600	1400	3.00	NA	NA	NA	NA	NA	NA	NA
Erebia_ligea	Nymphalidae	564	5	5	0.75	0.5	1.0	0.5	41.0	10	0.183	0	1	1	0	0	1	0	0	0	2500	3.02	1	0	0	0	0	0	1

species	family	range	conservation		GEN_Average				WSP_Female_average	WSP_Fe-						ELT_sin-					FM_Average				AFB_honey-	AFB_ani-	AFB_min-	flower
Erebia_manto	Nymphalidae	89	5	5	0.50	0.5	0.5	0.0	39.0	10	0.316	0	1	0	0	1	0	0	900	1600	3.00	1	0	0	0	0	0	0
Erebia_medusa	Nymphalidae	361	5	5	0.75	0.5	1.0	0.5	38.0	8	0.224	1	1	0	0	1	0	0	200	2350	3.51	1	0	0	0	0	0	0
Erebia_melampus	Nymphalidae	56	5	5	1.00	1.0	1.0	0.0	33.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	800	1600	3.00	1	0	0	0	0	0	0
Erebia_melas	Nymphalidae	31	5	5	1.00	1.0	1.0	0.0	45.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	200	2600	3.51	1	0	0	0	0	0	0
Erebia_meolans	Nymphalidae	139	5	5	1.00	1.0	1.0	0.0	46.0	16	0.200	1	1	0	0	1	0	0	150	2250	4.00	1	0	0	0	0	0	0
Erebia_mnestra	Nymphalidae	22	5	5	0.75	0.5	1.0	0.5	36.0	4	0.500	0	1	0	0	NA	NA	NA	1500	1100	2.00	1	0	0	0	0	0	0
Erebia_montana	Nymphalidae	38	5	5	1.00	1.0	1.0	0.0	47.0	6	0.354	1	0	0	0	NA	NA	NA	1100	1400	3.00	1	0	0	0	0	0	0
Erebia_neoridas	Nymphalidae	48	5	5	1.00	1.0	1.0	0.0	41.0	10	0.289	0	1	0	0	1	0	0	500	1100	2.51	1	0	0	0	0	0	0
Erebia_nivalis	Nymphalidae	14	5	5	0.50	0.5	0.5	0.0	32.0	4	1.000	NA	NA	NA	NA	1	0	0	2100	500	1.51	1	0	0	0	0	0	0
Erebia_oeme	Nymphalidae	89	5	5	0.75	0.5	1.0	0.5	42.0	8	0.100	1	1	0	0	1	0	0	800	1800	3.00	1	0	0	0	0	0	0
Erebia_orientalis	Nymphalidae	5	5	5	1.00	1.0	1.0	0.0	30.5	3	0.289	NA	NA	NA	NA	NA	NA	NA	1800	800	2.51	1	0	0	0	0	0	0
Erebia_ottomana	Nymphalidae	42	5	5	1.00	1.0	1.0	0.0	39.0	10	0.707	NA	NA	NA	NA	NA	NA	NA	450	2150	3.02	1	0	0	0	0	0	0

species	family	range	conservation	popsize	GEN_Average	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Female_average	WSP_Fe[illegible]	HSI[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	AFB_ani[illegible]	AFB_min[illegible]
Erebia_ipalarica	Nymphalidae	5	5	5	1.00	1.0	1.0	0.0	58.0	4	0.289	8	1	1	0	0	0	1	0	1000	650	3.00	1	0	0	0	0	0	0
Erebia_ipandrose	Nymphalidae	194	5	5	0.50	0.5	0.5	0.0	40.0	10	0.192	0	1	1	0	0	1	0	0	0	3100	2.51	1	1	0	0	0	0	0
Erebia_ipharte	Nymphalidae	59	5	5	0.50	0.5	0.5	0.0	36.0	8	0.167	NA	NA	NA	NA	NA	NA	NA	NA	1000	1500	2.00	1	0	0	0	0	0	0
Erebia_ipluto	Nymphalidae	51	5	5	0.75	0.5	1.0	0.5	45.0	10	0.354	5	1	1	0	0	1	0	0	1600	1600	2.51	NA	NA	NA	NA	NA	NA	NA
Erebia_ipolaris	Nymphalidae	16	5	5	0.75	0.5	1.0	0.5	39.0	10	0.250	5	0	1	0	0	1	0	0	0	400	1.51	NA	NA	NA	NA	NA	NA	NA
Erebia_ipronoe	Nymphalidae	81	5	5	1.00	1.0	1.0	0.0	46.0	8	0.707	NA	NA	NA	NA	NA	NA	NA	NA	900	1900	3.51	1	0	0	0	0	0	0
Erebia_irhodopensis	Nymphalidae	10	5	5	1.00	1.0	1.0	0.0	36.5	3	0.577	NA	NA	NA	NA	NA	NA	NA	NA	1400	1200	1.51	1	0	0	0	0	0	0
Erebia_irondoui	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	38.0	8	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1500	1000	2.00	1	0	0	0	0	0	0
Erebia_iscipio	Nymphalidae	9	5	5	0.75	0.5	1.0	0.5	48.0	4	0.500	NA	NA	NA	NA	NA	NA	NA	NA	1200	1300	2.00	1	0	0	0	0	0	0
Erebia_isthennyo	Nymphalidae	10	5	5	1.00	1.0	1.0	0.0	42.0	4	0.577	NA	NA	NA	NA	NA	NA	NA	NA	1700	800	2.51	NA	NA	NA	NA	NA	NA	NA
Erebia_istiria	Nymphalidae	17	5	5	1.00	1.0	1.0	0.0	49.0	6	0.408	NA	NA	NA	NA	NA	NA	NA	NA	300	1500	3.00	1	0	0	0	0	0	0
Erebia_istyx	Nymphalidae	25	5	5	0.75	0.5	1.0	0.5	51.0	10	0.707	NA	NA	NA	NA	NA	NA	NA	NA	200	2000	3.00	1	0	0	0	0	0	0

species	family	range	conservation	[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	[illegible]	AFB_min[illegible]	AFB_an[illegible] flower
Erebia_sudetica	Nymphalidae	13	3	3	1.00	1.0	1.0	0.0	28.5	3	1.000	NA	NA	NA	NA	NA	1	0	0	600	1600	2.51	1	0	0	0	0	0	0
Erebia_triarius	Nymphalidae	72	5	5	1.00	1.0	1.0	0.0	47.0	6	0.289		1	1	0	0	NA	NA	NA	400	2100	4.00	1	0	0	0	0	0	1
Erebia_tyndarus	Nymphalidae	25	5	5	1.00	1.0	1.0	0.0	35.0	2	0.500	NA	NA	NA	NA	NA	NA	NA	NA	1200	1500	3.02	1	0	0	0	0	0	0
Erebia_zapateri	Nymphalidae	6	5	5	1.00	1.0	1.0	0.0	38.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	1000	650	3.51	1	0	0	0	0	0	0
Erynnis_marloyi	Hesperiidae	31	5	5	2.00	1.0	3.0	2.0	31.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	NA	0	2100	6.04	1	0	0	0	0	0	0
Erynnis_pelages	Hesperiidae	842	5	5	1.50	1.0	2.0	1.0	30.0	4	0.129		0	1	0	0	1	0	0	0	2000	4.04	1	0	0	0	0	0	0
Euchloe_ausonia	Pieridae	352	5	5	2.00	1.0	3.0	2.0	44.0	8	0.126		0	1	0	0	1	0	0	0	1900	5.02	1	0	0	0	0	0	0
Euchloe_bazae	Pieridae	5	3	3	1.50	1.0	2.0	1.0	34.0	4	0.500		1	0	0	0	1	1	0	0	800	4.00	1	0	0	0	0	0	0
Euchloe_belemia	Pieridae	63	5	5	2.00	2.0	2.0	0.0	40.0	8	0.354		1	0	0	0	1	0	0	0	1500	5.00	1	0	0	0	0	0	0
Euchloe_charlonia	Pieridae	NA	5	5	2.50	2.0	3.0	1.0	34.0	4	0.036		1	1	0	0	1	1	0	0	3000	8.51	1	0	0	0	0	0	0
Euchloe_crameri	Pieridae	197	5	5	1.50	1.0	2.0	1.0	44.0	8	0.154		0	1	0	0	1	0	0	NA	NA	3.00	1	0	0	0	0	0	0
Euchloe_eversi	Pieridae	NA	5	5	2.00	2.0	2.0	0.0	40.0	8	0.289	NA	NA	NA	NA	NA	1	0	0	1700	800	4.00	1	0	0	0	0	0	0

species	family	range	con-serv...	con-ser-...	GEN_Average				WSP_Female_average	WSP_Fe-...										ELT_sin-...		FM_Average					AFB_honey-...	AFB_ani-...	AFB_min-...
Euchloe_grancanariensis	Pieridae	NA	5	5	2.00	2.0	2.0	0.0	40.0	8	1.000	NA	NA	NA	NA	NA	NA	NA	50	1900	7.00	NA	NA	NA	NA	NA	NA	NA
Euchloe_hesperidum	Pieridae	NA	5	5	2.00	2.0	2.0	0.0	40.0	8	0.289	NA	NA	NA	NA	NA	NA	NA	0	400	6.00	1	0	0	0	0	0	0
Euchloe_insularis	Pieridae	16	5	5	1.75	1.5	2.0	0.5	34.5	3	0.250	0	1	0	0	1	0	0	0	1300	5.00	1	0	0	0	0	0	0
Euchloe_penia	Pieridae	14	5	5	1.50	1.0	2.0	1.0	34.0	4	0.408	1	1	0	0	1	0	0	0	2100	5.00	1	0	0	0	0	0	0
Euchloe_simplonia	Pieridae	32	5	5	0.75	0.5	1.0	0.5	43.0	6	0.333	1	1	0	0	1	1	0	1000	1400	4.00	1	0	0	0	0	0	0
Euchloe_tagis	Pieridae	56	5	5	1.00	1.0	1.0	0.0	35.0	10	0.577	1	1	1	0	1	0	0	0	1600	3.00	1	0	0	0	0	0	0
Eumedonia_eumedon	Lycaenidae	441	5	5	1.00	1.0	1.0	0.0	28.0	8	0.218	1	1	0	0	1	0	0	0	2400	4.00	1	0	0	0	0	0	0
Euphydryas_aurinia	Nymphalidae	538	5	5	1.00	1.0	1.0	0.0	36.5	13	0.102	1	1	0	0	0	0	1	0	2600	3.53	1	0	0	0	0	0	0
Euphydryas_cynthia	Nymphalidae	58	5	5	0.75	0.5	1.0	0.5	37.0	10	0.289	1	1	0	0	0	1	1	900	2200	3.00	1	0	0	0	0	0	0
Euphydryas_desfontainii	Nymphalidae	41	4	4	1.00	1.0	1.0	0.0	46.0	12	1.000	0	1	0	0	0	0	1	0	2800	3.00	1	0	0	0	0	0	0
Euphydryas_iduna	Nymphalidae	24	4	4	1.00	1.0	1.0	0.0	41.0	8	0.316	0	1	0	0	0	1	0	300	400	2.00	NA	NA	NA	NA	NA	NA	NA

species	family	range	con-serv...	con-ser...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe...	HSI							ELT_sin...				FM_Average				AFB_honey...		AFB_ani...	AFB_min... flower
Euphydryas_intermedia	Nymphalidae	28	5	5	0.75	0.5	1.0	0.5	40.0	4	0.577	0	1	0	1	0	0	1	1	1400	1000	3.00	1	0	0	0	0	0	0
Euphydryas_maturna	Nymphalidae	210	3	5	0.75	0.5	1.0	0.5	41.5	9	0.046	0	0	1	1	1	0	0	1	100	900	2.51	1	0	0	1	0	0	0
Fabriciana_adippe	Nymphalidae	888	5	5	1.00	1.0	1.0	0.0	53.5	9	0.500	0	0	1	0	0	1	0	0	0	2300	3.53	1	0	1	0	0	0	1
Fabriciana_elisa	Nymphalidae	8	5	5	1.00	1.0	1.0	0.0	49.0	6	1.000	0	0	1	0	0	1	0	0	400	1600	3.00	1	0	0	0	0	0	0
Fabriciana_niobe	Nymphalidae	646	5	4	1.00	1.0	1.0	0.0	49.5	9	0.408	0	1	1	0	0	1	0	0	0	2500	2.53	1	0	0	0	0	0	0
Favonius_quercus	Lycaenidae	777	5	5	1.00	1.0	1.0	0.0	32.0	6	0.408	0	0	0	0	1	1	0	0	0	2000	5.02	0	0	0	1	0	1	1
Freyeria_trochylus	Lycaenidae	19	5	5	3.00	3.0	3.0	0.0	16.5	3	0.707	NA	NA	NA	NA	NA	NA	NA	NA	0	1000	8.00	1	0	0	0	0	0	0
Gegenes_nostrodamus	Hesperiidae	65	5	5	3.00	3.0	3.0	0.0	32.0	4	0.289	0	0	1	0	0	1	0	0	0	1900	9.00	1	0	0	0	0	0	1
Gegenes_pumilio	Hesperiidae	76	5	5	3.00	3.0	3.0	0.0	32.0	4	0.354	0	0	1	0	0	1	0	0	0	1800	9.00	1	0	0	0	0	0	0
Glaucopsyche_alexis	Lycaenidae	609	5	5	1.00	1.0	1.0	0.0	29.0	8	0.065	0	0	1	0	0	1	0	0	0	1900	5.00	1	0	0	0	0	1	1
Glaucopsyche_melanops	Lycaenidae	103	5	5	1.00	1.0	1.0	0.0	27.0	10	0.224	0	0	1	0	0	1	0	0	100	1000	2.00	1	0	0	0	0	0	1

species	family	range	con-serv-...	con-... size	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe-...	HSI						ELT_sin-...				FM_Average			AFB_honey-...	AFB_mini-...	AFB_an-...	AFB_min-...	...flower
Glaucopsyche_paphos	Lycaenidae	NA	5	5	1.00	1.0	1.0	0.0	29.0	6	0.289	0	1	0	0	1	0	0	0	1800	NA	NA	NA	NA	NA	NA	NA	NA
Gonepteryx_cleobule	Pieridae	NA	3	3	3.00	3.0	3.0	0.0	61.5	13	0.577	0	0	1	1	1	0	0	300	1700	4.04	1	0	0	0	0	0	0
Gonepteryx_cleopatra	Pieridae	393	5	5	2.00	1.0	3.0	2.0	59.0	18	0.577	0	0	1	0	1	0	0	0	2000	7.53	1	0	0	0	0	0	0
Gonepteryx_farinosa	Pieridae	59	5	5	1.00	1.0	1.0	0.0	60.0	8	0.577	0	0	1	0	1	0	0	0	2500	11.00	1	0	0	0	0	0	0
Gonepteryx_maderensis	Pieridae	NA	2	2	3.00	3.0	3.0	0.0	61.5	13	1.000	NA	NA	NA	NA	NA	NA	NA	500	1000	9.06	0	0	1	0	0	0	0
Gonepteryx_rhamni	Pieridae	1177	[illegible]	5	1.00	1.0	1.0	0.0	58.0	12	0.218	0	0	1	0	1	0	0	0	2000	8.02	1	0	1	0	0	0	0
Hamearis_lucina	Riodinidae	497	5	5	1.00	1.0	1.0	0.0	32.5	3	0.577	1	1	0	0	0	1	0	0	1700	6.00	1	0	0	0	0	0	0
Hesperia_comma	Hesperiidae	807	5	5	1.00	1.0	1.0	0.0	31.0	6	0.333	1	1	0	0	1	0	0	0	2200	3.53	1	0	0	0	0	0	0
Heteropterus_morpheus	Hesperiidae	270	5	5	1.00	1.0	1.0	0.0	33.5	7	0.250	0	1	0	0	1	0	0	0	1500	3.02	1	0	0	0	0	0	0
Hipparchia_aristaeus	Nymphalidae	13	5	5	1.00	1.0	1.0	0.0	52.0	4	1.000	NA	NA	NA	NA	NA	NA	NA	0	2000	4.55	1	0	0	0	0	0	0
Hipparchia_autonoe	Nymphalidae	NA	5	NA	1.00	1.0	1.0	0.0	54.0	8	0.102	NA	NA	NA	NA	1	0	0	0	1600	2.00	1	0	1	0	0	1	0
Hipparchia_azorina	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	41.0	6	1.000	0	1	0	0	NA	NA	NA	480	1525	[illegible]	1	0	1	0	0	0	0
Hipparchia_bacchus	Nymphalidae	NA	3	3	1.00	1.0	1.0	0.0	59.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	300	1200	2.00	NA	NA	NA	NA	NA	NA	NA

species	family	range	conservation	conser-	GEN_Average				WSP_Female_average	WSP_Fe-							ELT_sin-						FM_Average				AFB_honey-		AFB_an-	AFB_min-
Hipparchia_blachieri	Nymphalidae	9	NA	NA	1.00	1.0	1.0	0.05	2.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1900	4.53	NA	NA	NA	NA	NA	NA	NA
Hipparchia_christenseni	Nymphalidae	1	5	1-5	1.00	1.0	1.0	0.05	1.0	16	0.289	NA	NA	NA	NA	NA	NA	NA	NA	250	650	2.02	NA	NA	NA	NA	NA	NA	NA
Hipparchia_cretica	Nymphalidae	9	5	1-5	1.00	1.0	1.0	0.05	6.0	8	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1500	5.53	1	0	0	0	0	0	0
Hipparchia_cypriensis	Nymphalidae	NA	5	1-5	1.00	1.0	1.0	0.05	6.5	13	0.408	0	1	1	0	0	1	0	0	0	1500	9.00	0	0	0	0	1	0	0
Hipparchia_fagi	Nymphalidae	309	4	1-4	1.00	1.0	1.0	0.06	6.0	8	0.250	0	1	1	0	0	1	0	0	0	2400	4.53	1	0	1	0	1	0	0
Hipparchia_fatua	Nymphalidae	48	5	1-5	1.00	1.0	1.0	0.05	7.5	15	0.354	0	1	1	0	0	NA	NA	NA	0	1800	6.51	NA	NA	NA	NA	NA	NA	NA
Hipparchia_fidia	Nymphalidae	92	5	1-5	1.00	1.0	1.0	0.05	9.0	6	0.144	0	0	1	0	0	1	0	0	0	1400	3.51	1	0	0	0	0	1	1
Hipparchia_gomera	Nymphalidae	NA	5	1-5	1.00	1.0	1.0	0.05	9.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	NA	200	100	5.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_hermione	Nymphalidae	237	4	1-4	1.00	1.0	1.0	0.06	1.0	10	0.408	0	1	1	0	0	1	0	0	0	1900	2.02	1	0	1	0	0	0	0
Hipparchia_leighebi	Nymphalidae	1	4	1-4	1.00	1.0	1.0	0.05	2.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	500	4.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_maderensis	Nymphalidae	NA	5	1-5	1.00	1.0	1.0	0.04	4.0	8	NA	0	0	1	0	0	NA	NA	NA	800	1000	3.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_mersina	Nymphalidae	3	NA	NA	1.00	1.0	1.0	0.05	1.0	16	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1300	4.53	0	0	0	0	0	1	1

species	family																												
Hipparchia_miguelensis	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	41.0	6	1.000	NA	NA	NA	NA	NA	NA	NA	NA	600	400	4.00	1	0	1	0	0	0	0
Hipparchia_neapolitana	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	NA	NA	0.408	NA	NA	NA	NA	NA	NA	NA	NA	800	300	3.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_neomiris	Nymphalidae	9	5	5	1.00	1.0	1.0	0.0	48.0	4	1.000	NA	NA	NA	NA	NA	1	0	0	0	2000	3.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_pellucida	Nymphalidae	2	5	5	1.00	1.0	1.0	0.0	51.0	16	0.289	1	1	1	0	0	1	0	0	0	1000	4.02	1	0	0	0	0	1	0
Hipparchia_sbordonii	Nymphalidae	NA	4	4	1.00	1.0	1.0	0.0	52.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	200	2.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_semele	Nymphalidae	814	5	5	1.00	1.0	1.0	0.0	51.0	16	0.143	1	1	1	0	0	1	0	0	0	2000	3.53	1	1	1	0	1	0	0
Hipparchia_senthes	Nymphalidae	56	5	5	1.00	1.0	1.0	0.0	52.0	4	1.000	NA	NA	NA	NA	NA	NA	NA	NA	0	2200	7.02	1	0	0	0	0	0	0
Hipparchia_statilinus	Nymphalidae	360	4	4	1.00	1.0	1.0	0.0	45.0	2	0.123	1	1	1	0	0	1	0	0	0	2500	4.04	1	0	1	0	0	1	1
Hipparchia_syriaca	Nymphalidae	54	5	5	1.00	1.0	1.0	0.0	65.0	6	0.289	1	1	1	0	0	1	0	0	0	2000	5.55	0	0	0	0	1	0	0
Hipparchia_tamadabae	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	55.5	5	0.289	NA	NA	NA	NA	NA	NA	NA	NA	400	1600	6.00	NA	NA	NA	NA	NA	NA	NA
Hipparchia_tilosi	Nymphalidae	NA	3	3	1.00	1.0	1.0	0.0	59.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	NA	400	900	3.00	NA	NA	NA	NA	NA	NA	NA

species	family	range	conservation	con...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe...	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin...	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey...	[illegible]	AFB_an...	AFB_min...	...flower
Hipparchia_volgensis	Nymphalidae	42	5	5	1.00	1.0	1.0	0.0	53.5	9	1.00	0	1	1	0	0	1	0	0	0	2500	4.02	1	0	0	0	0	0	0
Hipparchia_wyssii	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	59.0	6	0.28	9	1	1	0	0	NA	NA	NA	1400	600	3.00	NA	NA	NA	NA	NA	NA	NA
Hyponephele_lupina	Nymphalidae	143	5	5	1.00	1.0	1.0	0.0	45.0	6	0.16	9	1	1	0	0	1	0	0	0	2300	4.55	1	0	0	1	1	0	0
Hyponephele_lycaon	Nymphalidae	365	5	5	1.00	1.0	1.0	0.0	38.0	8	0.20	4	0	1	0	0	1	0	0	0	2500	3.53	1	0	0	0	0	0	0
Iolana_debilitata	Lycaenidae	NA	NA	NA	1.50	1.5	1.5	0.0	39.0	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	800	1300	5.00	1	0	0	0	0	0	0
Iolana_iolas	Lycaenidae	102	4	4	1.50	1.5	1.5	0.0	39.0	6	0.70	7	1	1	0	0	1	0	0	100	1700	4.00	1	0	0	0	0	0	1
Iphiclides_feisthamelii	Papilionidae	NA	NA	NA	3.00	3.0	3.0	0.0	77.0	26	0.40	8	0	0	1	0	1	0	0	0	2700	7.51	1	0	0	0	0	0	0
Iphiclides_podalirius	Papilionidae	755	5	5	2.00	1.0	3.0	2.0	77.0	26	0.10	5	1	1	0	0	1	0	0	0	2000	6.04	1	0	1	0	0	1	0
Issoria_lathonia	Nymphalidae	976	5	5	2.00	1.0	3.0	2.0	42.5	5	0.40	8	1	1	0	0	1	0	0	0	2750	7.06	1	0	0	0	0	0	1
Kirinia_climene	Nymphalidae	9	5	5	1.00	1.0	1.0	0.0	47.0	2	0.70	7	1	1	0	0	1	0	0	700	1100	2.51	1	0	1	0	0	0	0

species	family	range	conservation	popsize	GEN_Average	GEN_…	GEN_…	GEN_…	WSP_Female_average	WSP_Fe…							ELT_sin…					FM_Average				AFB_…eye…		AFB_…i…	AFB_an… / AFB_min… flower
Kirinia_roxelana	Nymphalidae	86	5	5	1.00	1.0	1.0	0.0	60.0	4	0.204	NA	NA	NA	NA	NA	NA	NA	NA	0	2300	6.53	NA	NA	NA	NA	NA	NA	NA
Kretania_eurypilus	Lycaenidae	2	NA	NA	1.00	1.0	1.0	0.0	29.5	3	0.407	0	0	1	0	0	NA	NA	NA	1000	1200	2.00	NA	NA	NA	NA	NA	NA	NA
Kretania_hesperica	Lycaenidae	8	5	5	1.00	1.0	1.0	0.0	30.0	4	0.500	0	0	1	0	0	NA	NA	NA	600	900	4.00	1	0	0	0	0	0	1
Kretania_psylorita	Lycaenidae	5	5	5	1.00	1.0	1.0	0.0	24.5	3	0.577	0	0	1	0	0	NA	NA	NA	950	1050	2.00	1	0	0	0	0	0	0
Kretania_pylaon	Lycaenidae	16	4	NA	1.00	1.0	1.0	0.0	29.5	3	1.000	0	0	1	0	0	1	0	0	0	800	2.00	1	0	0	0	0	0	0
Kretania_sephirus	Lycaenidae	NA	5	5	1.00	1.0	1.0	0.0	31.6	6	0.577	NA	NA	NA	NA	NA	1	0	0	1000	1600	NANA	1	0	0	0	0	0	0
Kretania_trappi	Lycaenidae	6	4	NA	1.00	1.0	1.0	0.0	31.6	6	0.707	0	1	1	0	0	NA	NA	NA	1000	1000	3.00	NA	NA	NA	NA	NA	NA	NA
Laeosopis_roboris	Lycaenidae	82	5	5	1.00	1.0	1.0	0.0	27.6	6	0.707	0	1	0	0	1	1	0	0	100	1500	3.00	1	0	0	0	0	0	0
Lampides_boeticus	Lycaenidae	361	5	5	3.00	3.0	3.0	0.0	33.6	6	0.058	0	0	1	0	0	1	0	0	0	2700	9.00	1	0	0	0	0	0	0
Lasiommata_maera	Nymphalidae	888	5	5	2.00	1.0	3.0	2.0	47.5	7	0.072	0	0	1	0	0	1	1	0	0	2600	5.59	1	0	0	0	0	0	0
Lasiommata_megera	Nymphalidae	1053	5	5	2.00	1.0	3.0	2.0	42.5	9	0.120	0	0	1	0	0	1	1	0	0	2500	6.57	1	0	1	0	0	0	0

species	family	range	con-serv...	con-serv...	GEN_Av-er-age	GEN_Min	GEN_Max	GEN_Range	WSP_Fe-male_av-er-age	WSP_Fe-male_range	HSI	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin-...	[illegible]	[illegible]	[illegible]	[illegible]	FM_Av-er-age	[illegible]	[illegible]	[illegible]	[illegible]	AFB_hon-ey-...	Non-i-...	AFB_an-... / AFB_min-...flower
Lasiommata_paramegaera	Nymphalidae	15	5	5	3.00	3.0	3.0	0.0	42.5	9	0.354	6	0	1	0	0	1	0	0	0	1500	6.00	1	0	0	0	0	0	0
Lasiommata_petropolitana	Nymphalidae	352	5	5	1.50	1.0	2.0	1.0	38.0	6	0.258	6	0	1	0	0	1	0	0	100	1250	3.53	1	0	0	0	0	0	1
Leptidea_duponcheli	Pieridae	67	5	5	2.00	2.0	2.0	0.0	38.0	8	0.408	0	1	1	0	0	1	0	0	0	2400	5.00	1	0	0	0	0	0	0
Leptidea_juvernica	Pieridae	NA	NA	NA	1.00	1.0	1.0	0.0	42.0	0	NA	0	0	1	0	0	1	0	0	NA	NA	3.00	1	0	1	0	0	0	0
Leptidea_morsei	Pieridae	49	4	2	2.00	2.0	2.0	0.0	41.5	9	0.577	0	0	1	0	0	1	0	0	0	1400	5.00	1	0	0	0	0	0	1
Leptidea_reali	Pieridae	NA	5	5	2.00	1.0	3.0	2.0	38.0	10	1.000	0	0	1	0	0	1	0	0	0	2000	6.04	0	0	1	1	1	1	1
Leptidea_sinapis	Pieridae	1989	5	5	2.00	1.0	3.0	2.0	38.0	10	0.144	0	0	1	0	0	1	0	0	0	2000	6.04	1	0	0	0	0	0	1
Leptotes_pirithous	Lycaenidae	287	5	5	3.00	3.0	3.0	0.0	25.0	2	0.045	0	0	1	0	0	1	0	0	0	1900	8.00	1	0	1	0	0	0	0
Libythea_celtis	Nymphalidae	181	5	5	1.25	1.0	1.5	0.5	44.5	5	0.707	0	0	0	0	1	1	0	0	0	1800	6.53	1	0	0	0	0	0	1
Limenitis_camilla	Nymphalidae	526	5	5	1.00	1.0	1.0	0.0	56.0	8	0.289	0	0	0	1	1	1	0	0	0	1500	3.02	1	1	1	1	1	1	1
Limenitis_populi	Nymphalidae	529	5	4	1.00	1.0	1.0	0.0	77.5	11	0.577	0	0	0	0	1	1	0	0	100	1550	2.51	0	0	0	0	1	1	0
Limenitis_reducta	Nymphalidae	410	5	5	2.00	1.0	3.0	2.0	50.0	8	0.577	0	0	0	1	0	1	0	0	0	1950	5.04	1	0	1	1	1	1	1

species	family	range	conservation	core size	GEN_Average	GEN_[illegible]	GEN_[illegible]	GEN_Range	WSP_Female_average	WSP_Female_[illegible]	HSI	LEVEL_[illegible]	LEVEL_[illegible]	[illegible]	[illegible]	ELT_single[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	[illegible]	AFB_omni[illegible]	AFB_an[illegible] AFB_min[illegible]
Lopinga_achine	Nymphalidae	2753	3	[illegible]	1.00	1.0	1.0	0.0	44.0	8	0.0886	1	1	0	0	1	0	0	100	1400	2.51	1	0	0	1	1	0	1
Luthrodes_galba	Lycaenidae	NA	NA	NA	3.00	3.0	3.0	0.0	20.0	4	0.2889	NA	NA	NA	NA	NA	NA	NA	0	800	NA	NA	NA	NA	NA	NA	NA	NA
Lycaena_alciphron	Lycaenidae	519	5	4	1.00	1.0	1.0	0.0	34.0	4	0.5077	1	1	0	0	1	0	0	0	2500	4.00	1	0	0	0	0	0	0
Lycaena_candens	Lycaenidae	NA	5	5	1.00	1.0	1.0	0.0	34.5	1	1.000	1	0	0	0	1	1	0	900	1500	3.51	1	0	0	0	0	0	0
Lycaena_dispar	Lycaenidae	383	5	5	2.00	1.0	3.0	2.0	37.0	8	0.4008	1	1	0	0	1	1	0	0	1000	6.51	1	0	1	1	0	0	0
Lycaena_helle	Lycaenidae	148	2	5	1.25	1.0	1.5	0.5	24.0	6	0.2889	0	1	0	0	1	0	0	100	1700	6.00	1	0	1	0	0	0	0
Lycaena_hippothoe	Lycaenidae	689	5	4	1.00	1.0	1.0	0.0	30.5	7	0.2889	1	1	0	0	1	0	0	0	2500	4.51	1	0	0	0	0	0	0
Lycaena_ottomana	Lycaenidae	37	5	5	2.00	2.0	2.0	0.0	29.0	2	1.000	NA	NA	NA	NA	NA	NA	NA	0	1600	7.02	1	0	0	0	0	0	0
Lycaena_phlaeas	Lycaenidae	1340	5	5	2.00	1.0	3.0	2.0	26.5	11	0.3333	1	0	0	0	1	0	0	0	2400	9.51	1	0	1	0	0	1	1
Lycaena_thersamon	Lycaenidae	199	5	5	2.00	1.0	3.0	2.0	30.0	4	0.0889	NA	NA	NA	NA	1	0	0	0	2200	9.04	1	0	0	0	0	0	0
Lycaena_thetis	Lycaenidae	6	NA	NA	1.00	1.0	1.0	0.0	27.5	1	0.7077	NA	NA	NA	NA	NA	NA	NA	1500	800	2.00	1	0	0	0	0	0	0
Lycaena_tityrus	Lycaenidae	673	5	5	2.00	1.0	3.0	2.0	30.0	4	0.1336	1	1	0	0	1	0	0	0	2500	7.00	1	0	0	0	0	0	0
Lycaena_virgaureae	Lycaenidae	756	5	5	1.00	1.0	1.0	0.0	27.0	6	0.4008	1	0	0	0	1	0	0	200	2300	5.00	1	0	0	0	0	0	0

species	family	range	conservation	conservation	GEN_Average	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Female_average	WSP_Female_[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_single	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey	AFB_[illegible]	AFB_animal	AFB_minflower
Lysandra_albicans	Lycaenidae	40	5	5	1.00	1.0	1.0	0.0	39.0	6	1.00	0	0	1	0	0	NA	NA	NA	500	1000	3.00	1	0	0	0	0	0	1
Lysandra_bellargus	Lycaenidae	601	5	5	2.00	1.0	3.0	2.0	31.0	6	0.18	3	1	0	0	0	1	0	0	100	1900	7.00	1	0	0	0	0	1	1
Lysandra_coridon	Lycaenidae	575	4	4	1.50	1.0	2.0	1.0	33.0	6	1.00	0	1	0	0	0	1	0	0	100	2400	3.00	1	0	0	0	0	1	1
Lysandra_corydonius	Lycaenidae	NA	5	NA	1.00	1.0	1.0	0.0	33.0	6	NA	0	1	1	0	0	1	0	0	0	2900	3.00	1	0	0	0	0	0	0
Lysandra_hispana	Lycaenidae	50	5	5	2.00	2.0	2.0	0.0	34.0	4	1.00	0	0	1	0	0	1	0	0	100	900	7.00	1	0	0	0	0	0	1
Maniola_chia	Nymphalidae	2	5	5	1.00	1.0	1.0	0.0	41.5	9	0.28	9	1	1	0	0	1	1	0	0	800	5.00	1	0	0	0	0	0	0
Maniola_cypricola	Nymphalidae	NA	5	5	1.00	1.0	1.0	0.0	NA	NA	0.28	9	1	1	0	0	1	1	0	NA	NA	4.00	1	0	1	0	0	0	0
Maniola_halicarnassus	Nymphalidae	NA	4	4	1.00	1.0	1.0	0.0	44.5	5	0.28	9	1	1	0	0	1	1	0	0	450	3.04	1	0	0	0	0	0	0
Maniola_jurtina	Nymphalidae	1289	[illegible]	5	1.00	1.0	1.0	0.0	41.5	9	0.28	9	1	1	0	0	0	1	0	0	2500	5.06	1	0	1	0	0	0	0
Maniola_megala	Nymphalidae	2	NA	NA	1.00	1.0	1.0	0.0	41.5	9	0.28	9	1	1	0	0	1	1	0	0	900	3.53	1	0	1	0	0	0	0
Maniola_nurag	Nymphalidae	5	5	5	1.00	1.0	1.0	0.0	38.0	4	1.00	0	1	1	0	0	1	1	0	400	900	3.51	1	0	0	0	0	0	0

species	family	range	conservation		GEN_Average	GEN_			WSP_Female_average	WSP_Female							ELT_single					FM_Average					AFB_honey	AFB_ani	AFB_minflower
Maniola_telmessia	Nymphalidae	7	5	1-5	1.00	1.0	1.0	0.0	41.5	9	0.35	54	1	1	0	0	1	1	0	0	1300	7.55	1	0	0	0	0	0	0
Melanargia_arge	Nymphalidae	33	5	1-5	1.00	1.0	1.0	0.0	53.0	6	0.289	NA	NA	NA	NA	NA	NA	NA	NA	300	1200	2.00	1	0	0	0	0	0	0
Melanargia_galathea	Nymphalidae	802	5	1-5	1.00	1.0	1.0	0.0	47.5	5	0.10	07	1	1	0	0	1	1	0	0	2500	3.53	1	0	0	0	0	0	0
Melanargia_ines	Nymphalidae	79	5	1-5	1.00	1.0	1.0	0.0	48.0	4	0.50	00	0	1	0	0	NA	NA	NA	0	2600	4.00	1	0	0	0	0	0	0
Melanargia_lachesis	Nymphalidae	115	5	1-5	1.00	1.0	1.0	0.0	49.0	8	0.16	36	1	1	0	0	1	0	0	0	1600	2.51	1	0	0	0	0	0	0
Melanargia_larissa	Nymphalidae	73	5	1-5	1.00	1.0	1.0	0.0	55.0	10	0.70	07	1	1	0	0	1	0	0	0	2400	4.02	1	0	0	0	0	0	0
Melanargia_occitanica	Nymphalidae	85	5	1-5	1.00	1.0	1.0	0.0	51.0	10	0.15	54	1	1	0	0	1	0	0	0	2000	2.51	1	0	0	0	0	0	0
Melanargia_pherusa	Nymphalidae	4	5	1-5	1.00	1.0	1.0	0.0	48.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	NA	600	800	2.51	1	0	0	0	0	0	0
Melanargia_russiae	Nymphalidae	115	5	1-5	1.00	1.0	1.0	0.0	55.0	10	0.12	20	1	1	0	0	1	0	0	500	1900	3.00	1	0	0	0	0	0	0
Melitaea_aetherie	Nymphalidae	26	5	1-5	1.50	1.0	2.0	1.0	44.0	4	0.408	NA	NA	NA	NA	NA	0	1	1	0	1800	2.51	1	0	0	0	0	0	1

species	family	range	conserv[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Aver[illegible]	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	[illegible]	[illegible]	AFB_min[illegible]
Melitaea_arduinna	Nymphalidae	145	5	1.00	1.0	1.0	0.0	44.0	4	0.50	77	1	0	0	0	0	0	1	500	1350	3.51	1	0	0	0	0	0	0
Melitaea_asteria	Nymphalidae	155	5	0.50	0.5	0.5	0.0	29.0	2	1.00	00	1	1	0	0	0	1	1	2000	1000	2.00	1	0	0	0	0	0	0
Melitaea_athalia	Nymphalidae	1015	5	1.50	1.0	2.0	2.0	35.5	9	0.10	07	1	1	0	0	0	0	1	0	2300	3.53	1	0	0	0	0	1	0
Melitaea_aurelia	Nymphalidae	2684	5	1.00	1.0	1.0	0.0	30.0	4	0.08	83	0	1	0	0	0	1	1	100	2000	2.00	1	0	0	0	0	0	0
Melitaea_britomartis	Nymphalidae	994	4	1.50	1.0	2.0	1.0	33.0	6	0.20	24	0	1	0	0	0	0	1	200	700	3.02	1	0	0	0	0	0	0
Melitaea_celadussa	Nymphalidae	NA	NA	1.50	1.0	2.0	1.0	35.5	9	0.10	NA	NA	NA	NA	NA	NA	NA	NA	0	2600	3.02	1	0	0	0	0	0	1
Melitaea_cinxia	Nymphalidae	6735	5	1.50	1.0	2.0	1.0	35.5	9	0.28	89	1	1	0	0	0	0	1	0	2600	4.04	1	0	0	0	0	0	0
Melitaea_deione	Nymphalidae	1085	5	1.50	1.0	2.0	1.0	39.0	14	0.10	20	1	1	0	0	0	1	1	200	1900	4.53	1	0	0	0	0	0	1
Melitaea_diamina	Nymphalidae	4615	4	1.50	1.0	2.0	1.0	35.5	9	0.10	26	1	1	0	0	0	0	1	100	2100	3.55	1	0	0	0	0	0	1
Melitaea_didyma	Nymphalidae	6215	5	2.50	2.0	3.0	1.0	37.0	14	0.05	51	0	1	0	0	0	0	1	0	2700	5.55	1	0	0	0	0	0	0
Melitaea_ornata	Nymphalidae	NA	NA	1.00	1.0	1.0	0.0	41.5	7	0.28	89	0	1	0	0	0	0	1	0	1900	4.00	1	0	0	0	0	0	0

species	family	range	conservation	popsize	GEN_Average	GEN_Min	GEN_Max	GEN_Range	WSP_Female_average	WSP_Female_range	HSI						ELT_single					FM_Average				AFB_honey		AFB_animal	AFB_mineral
Melitaea_parthenoides	Nymphalidae	172	5	5	1.50	1.0	2.0	1.0	33.0	6	0.10	5	0	1	0	0	0	1	1	100	2300	3.02	1	0	0	0	0	1	1
Melitaea_phoebe	Nymphalidae	521	5	5	1.50	1.0	2.0	1.0	44.5	11	0.15	4	0	1	0	0	0	0	1	0	2700	4.55	1	0	0	0	0	0	1
Melitaea_trivia	Nymphalidae	260	5	4	2.00	1.0	3.0	2.0	33.0	10	0.44	7	0	1	0	0	0	0	1	0	2400	5.06	1	0	0	0	0	0	1
Melitaea_varia	Nymphalidae	41	5	5	1.00	1.0	1.0	0.0	34.0	8	0.28	9	1	1	0	0	0	1	1	1200	1400	3.00	1	0	0	0	0	0	0
Minois_dryas	Nymphalidae	48	5	5	1.00	1.0	1.0	0.0	62.0	16	0.20	0	1	1	0	0	0	1	0	0	1600	3.02	1	0	0	0	0	1	0
Muschampia_cribrellum	Hesperiidae	7	4		1.00	1.0	1.0	0.0	29.0	6	0.28	NA	NA	NA	NA	NA	NA	NA	NA	0	1000	3.00	1	0	0	0	0	0	1
Muschampia_proto	Hesperiidae	88	5		1.00	1.0	1.0	0.0	34.5	9	0.57	7	1	1	0	0	1	0	0	0	2000	4.02	1	0	0	0	0	0	1
Muschampia_tessellum	Hesperiidae	22	5		1.00	1.0	1.0	0.0	33.5	5	0.50	NA	NA	NA	NA	NA	NA	NA	NA	0	1900	4.51	1	0	0	0	0	0	0
Neptis_rivularis	Nymphalidae	150	5	5	1.00	1.0	1.0	0.0	52.0	4	0.25	NA	NA	NA	NA	NA	1	0	0	100	1500	3.51	0	0	1	0	0	0	0
Neptis_sappho	Nymphalidae	104	5	5	1.50	1.0	2.0	1.0	54.0	8	0.40	NA	NA	NA	NA	NA	1	0	0	100	1450	4.51	NA	NA	NA	NA	NA	NA	NA
Nymphalis_antiopa	Nymphalidae	918	5	5	1.25	1.0	1.5	0.5	67.5	17	0.19	2	0	0	1	1	0	0	1	0	2000	5.57	1	0	1	1	1	1	1
Nymphalis_polychloros	Nymphalidae	845	5	3	1.50	1.0	2.0	1.0	62.0	12	0.13	6	0	0	1	1	0	0	1	0	2600	6.57	1	0	1	0	1	1	1

species	family	range	conservation…	conservation…	GEN_Average	GEN_…	GEN_…	GEN_…	WSP_Female_average	WSP_Fe…	[illegible]	[illegible]	LEVEL…	VEG…	[illegible]	[illegible]	ELT_single…	ELT_…	ELT_…	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_heyday…	AFB_…	AFB_an… / AFB_min…	…_flower
Nymphalis_vau-album	Nymphalidae	725	5	5	1.00	1.0	1.0	0.0	63.0	10	0.35	54	0	0	0	1	0	0	1	0	1500	3.53	0	0	0	0	0	0	1
Nymphalis_xanthomelas	Nymphalidae	113	5	4	1.00	1.0	1.0	0.0	62.0	12	0.70	07	0	0	0	1	0	0	1	0	2000	4.53	0	0	0	0	1	0	0
Ochlodes_sylvanus	Hesperiidae	1058	[illegible]	5	1.50	1.0	2.0	1.0	30.0	6	0.08	83	0	1	0	0	1	0	0	0	2300	4.00	1	0	0	0	0	1	1
Oeneis_bore	Nymphalidae	19	5	5	0.50	0.5	0.5	0.0	43.0	10	1.00	00	0	1	0	0	NA	NA	NA	100	900	1.51	NA	NA	NA	NA	NA	NA	NA
Oeneis_glacialis	Nymphalidae	46	5	5	0.50	0.5	0.5	0.0	53.0	6	1.00	NA	NA	NA	NA	NA	1	0	0	1400	1500	3.00	1	0	0	0	0	0	0
Oeneis_jutta	Nymphalidae	166	5	5	0.75	0.5	1.0	0.5	53.0	10	0.35	54	0	1	0	0	NA	NA	NA	NA	NA	2.51	0	0	1	0	0	0	0
Oeneis_…	Nymphalidae	54	4	4	0.50	0.5	0.5	0.0	47.0	14	0.23	36	0	1	0	0	1	0	0	200	700	2.00	NA	NA	NA	NA	NA	NA	NA
Papilio_alexanor	Papilionidae	49	5	5	1.00	1.0	1.0	0.0	64.0	4	0.10	18	0	1	0	0	NA	NA	NA	0	2400	4.00	1	0	0	0	0	0	0
Papilio_hospiton	Papilionidae	14	5	5	1.25	1.0	1.5	0.5	76.0	10	0.17	77	1	1	0	0	1	0	0	50	1450	3.00	1	0	0	0	0	0	0
Papilio_machaon	Papilionidae	1224	[illegible]	5	2.00	1.0	3.0	2.0	75.0	30	0.05	53	0	1	0	0	1	0	0	0	3000	6.55	1	0	1	0	0	0	0
Pararge_aegeria	Nymphalidae	1178	[illegible]	5	2.00	1.0	3.0	2.0	40.0	4	0.15	54	0	1	0	0	1	0	0	0	2500	7.010	1	0	1	0	1	0	0

species	family	range	con-serv…		GEN_Av-er-age				WSP_Fe-male_av-er-age	WSP_Fe-					ELT_sin-							FM_Av-er-			AFB_ey-		AFB_an-		AFB_min-
Para…_Alpha	Nymphalidae	NA		12	3.00	3.0	3.0	0.0	45.5	3	0.102	0	1	1	0	0	1	0	0	0	1000	12.0	0	0	1	1	1	0	0
Para…_Alphoides	Nymphalidae	NA		15	3.00	3.0	3.0	0.0	37.5	1	0.102	0	1	1	0	0	1	0	0	0	2000	12.0	0	0	1	1	1	0	0
Parnassius_apollo	Papilionidae	354	4	4	1.00	1.0	1.0	0.0	80.0	30	0.204	0	1	0	0	0	1	1	0	0	3000	4.51	1	0	0	0	0	0	0
Parnassius_mnemosyne	Papilionidae	371	4	5	1.00	1.0	1.0	0.0	58.0	12	0.354	1	1	0	0	0	1	0	0	0	2500	3.00	1	0	0	0	0	0	0
Parnassius_phoebus	Papilionidae	48	4	4	1.00	1.0	1.0	0.0	65.0	30	0.158	1	1	1	0	0	1	0	0	1600	1200	3.00	1	0	0	0	0	0	0
Pelopidas_thrax	Hesperiidae	1	NA	NA	3.00	3.0	3.0	0.0	39.5	5	0.218	0	0	1	0	0	1	0	0	500	1500	10.4	1	0	0	0	0	0	0
Phengaris_alcon	Lycaenidae	354	5	4	1.00	1.0	1.0	0.0	36.0	4	0.577	1	1	1	0	0	1	1	0	100	1200	3.00	1	0	0	0	0	0	0
Phengaris_arion	Lycaenidae	522	2	2	1.00	1.0	1.0	0.0	36.0	6	0.500	1	1	1	0	0	1	0	0	0	2400	4.00	1	0	0	0	0	0	0
Phengaris_nausithous	Lycaenidae	188	4	4	1.00	1.0	1.0	0.0	35.0	2	1.000	1	1	1	0	0	1	0	0	100	1500	3.00	1	0	0	0	0	0	0
Phengaris_teleius	Lycaenidae	252	3	3	1.00	1.0	1.0	0.0	34.0	4	1.000	1	1	1	0	0	1	0	0	100	1500	3.00	1	0	0	0	0	0	0
Pieris_cana…	Pieridae	NA	5	5	2.50	2.0	3.0	1.0	38.5	13	0.289	NA	NA	NA	NA	NA	NA	NA	NA	0	1000	7.00	1	0	0	0	0	0	0
Pieris_brassicae	Pieridae	1353	5	5	2.50	2.0	3.0	1.0	57.0	12	0.105	1	1	1	0	0	0	1	1	0	2500	7.06	1	0	1	0	0	0	0

species	family	range	conservation	popsize	GEN_Average				WSP_Female_average	WSP_Female_range	HSI								ELT_single		FM_Average				AFB_honey			AFB_min_flower
Pieris_bryoniae	Pieridae	114	5	5	1.50	1.0	2.0	1.0	38.5	13	0.204	1	0	0	0	1	1	0	600	2700	4.00	1	0	0	0	0	0	0
Pieris_cheiranthi	Pieridae	NA	2	2	3.00	3.0	3.0	0.0	62.5	5	0.289	1	1	1	0	0	1	1	200	1200	12.0	1	0	0	0	0	0	0
Pieris_ergane	Pieridae	125	5	5	2.00	1.0	3.0	2.0	42.0	12	0.408	1	1	0	0	1	0	0	0	2200	7.55	1	0	0	0	0	0	1
Pieris_krueperi	Pieridae	51	5	5	4.00	4.0	4.0	0.0	46.0	8	0.707	0	1	0	0	1	0	0	0	2000	8.00	1	0	0	0	0	0	0
Pieris_mannii	Pieridae	203	5	5	3.00	3.0	3.0	0.0	43.0	6	0.408	1	1	0	0	1	0	0	0	2000	7.55	1	0	0	0	0	0	0
Pieris_napi	Pieridae	140	5	5	2.00	1.0	3.0	2.0	40.0	16	0.104	1	1	0	0	1	0	0	0	2500	5.57	1	0	1	0	0	0	0
Pieris_rapae	Pieridae	136	3	5	2.00	1.0	3.0	2.0	44.5	11	0.108	1	1	0	0	0	1	0	0	3000	9.51	1	0	0	0	0	0	1
Plebejidea_loewii	Lycaenidae	3	NA	NA	1.00	1.0	1.0	0.0	28.5	3	0.707	NA	NA	NA	NA	NA	NA	NA	0	3000	3.51	1	0	0	0	0	0	0
Plebejus_argus	Lycaenidae	991	5	5	1.50	1.0	2.0	1.0	22.5	9	0.069	1	1	0	0	1	0	0	0	2400	4.00	1	0	0	0	0	1	1
Plebejus_argyrognomon	Lycaenidae	290	5	5	1.50	1.0	2.0	1.0	31.0	6	0.224	0	1	0	0	1	0	0	300	1400	4.00	1	0	0	0	0	0	0
Plebejus_bellieri	Lycaenidae	10	5	5	1.00	1.0	1.0	0.0	23.0	6	0.354	NA	NA	NA	NA	NA	NA	NA	0	1400	3.00	1	0	0	0	0	0	0
Plebejus_idas	Lycaenidae	774	5	5	1.50	1.0	2.0	1.0	24.5	5	0.041	0	1	0	0	1	0	0	100	2300	5.00	1	0	0	0	0	0	0
Polygonia_c-album	Nymphalidae	1098	[illegible]	5	2.00	1.0	3.0	2.0	46.0	12	0.050	0	1	1	1	1	0	0	0	2700	6.57	1	0	1	1	1	1	1

species	family	range	con-serv-...	conser-...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe-...										ELT_sin-...					FM_Average				AFB_honey-...		AFB_ani-...	AFB_min-flower
Polygonia_egea	Nymphalidae	158	5	5	2.00	1.0	3.0	2.0	45.0	2	0.50	77	0	1	0	0	1	1	0	0	2100	8.55	1	0	0	0	0	0	0
Polyommatus_admetus	Lycaenidae	57	5	5	1.00	1.0	1.0	0.0	34.0	8	0.71	007	1	1	0	0	NA	NA	NA	100	1700	3.00	1	0	0	0	0	0	0
Polyommatus_amandus	Lycaenidae	544	5	5	1.50	1.0	2.0	1.0	31.0	6	0.20	04	1	1	0	0	1	0	0	100	2000	3.00	1	0	0	0	0	0	1
Polyommatus_aroaniensis	Lycaenidae	13	5	5	1.00	1.0	1.0	0.0	30.5	5	1.00	00	0	1	0	0	1	0	0	400	1600	3.00	NA	NA	NA	NA	NA	NA	NA
Polyommatus_celina	Lycaenidae	NA	NA	NA	4.00	4.0	4.0	0.0	27.0	12	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	2800	11.0	1	0	0	0	0	0	1
Polyommatus_damocles	Lycaenidae	NA	NA	NA	1.00	1.0	1.0	0.0	31.5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	1700	3000	2.51	NA	NA	NA	NA	NA	NA	NA
Polyommatus_damon	Lycaenidae	163	4	4	1.00	1.0	1.0	0.0	32.0	4	0.40	47	1	0	0	0	1	0	0	600	1800	2.00	1	0	0	0	0	0	1
Polyommatus_daphnis	Lycaenidae	305	5	5	1.00	1.0	1.0	0.0	35.0	6	0.12	09	1	1	0	0	1	0	0	200	1800	3.00	1	0	0	0	0	0	1
Polyommatus_dolus	Lycaenidae	24	5	5	1.00	1.0	1.0	0.0	35.0	6	1.00	NA	NA	NA	NA	NA	1	0	0	200	800	2.00	1	0	0	0	0	0	0

species	family	range	con-serv-[illegible]	con-ser-[illegible]	GEN_Av-er-age	[illegible]	[illegible]	[illegible]	WSP_Fe-male_av-er-[illegible]	WSP_Fe-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Av-er-[illegible]	[illegible]	[illegible]	[illegible]	AFB_hon-ey-[illegible]	[illegible]	AFB_an-i-[illegible]	AFB_min-[illegible]flower
Poly-ommatus_dorylas	Lycaenidae	330	4	4	1.50	1.0	2.0	1.0	32.0	4	0.20	0.04	1	1	0	0	1	0	0	100	2200	4.00	1	0	0	0	0	0	0
Poly-ommatus_eros	Lycaenidae	88	4	4	1.00	1.0	1.0	0.0	31.0	10	0.40	0.08	0	1	0	0	1	0	0	600	2100	3.00	1	0	0	0	0	0	1
Poly-ommatus_escheri	Lycaenidae	167	5	5	1.00	1.0	1.0	0.0	28.0	8	0.50	0.00	1	1	0	0	1	0	0	100	1900	3.00	1	0	0	0	0	0	0
Poly-ommatus_fabressei	Lycaenidae	11	5	5	1.00	1.0	1.0	0.0	30.5	5	1.00	0.00	0	1	0	0	NA	NA	NA	900	600	3.00	1	0	0	0	0	0	1
Poly-ommatus_fulgens	Lycaenidae	27	5	5	1.00	1.0	1.0	0.0	32.0	4	1.00	0.00	0	1	0	0	NA	NA	NA	900	300	2.00	1	0	0	0	0	0	0
Poly-ommatus_golgus	Lycaenidae	3	3	3	1.00	1.0	1.0	0.0	28.0	4	1.00	1.00	1	1	0	0	1	0	0	1900	1100	2.00	1	0	0	0	0	0	0
Poly-ommatus_humedasae	Lycaenidae	2	2	2	1.00	1.0	1.0	0.0	30.5	5	1.00	NA	NA	NA	NA	NA	NA	NA	NA	1000	1000	2.00	1	0	0	0	0	0	0
Poly-ommatus_icarus	Lycaenidae	1476	5	5	2.50	1.0	4.0	3.0	28.5	11	0.10	0.44	1	1	0	0	1	0	0	0	2900	7.00	1	0	0	0	0	1	1
Poly-ommatus_iphigenia	Lycaenidae	2	NA	NA	1.00	1.0	1.0	0.0	30.0	4	1.00	NA	NA	NA	NA	NA	NA	NA	NA	500	2300	2.51	NA	NA	NA	NA	NA	NA	NA

species	family	range	con-serv-[illegible]	con-ser-[illegible]	GEN_Average	[illegible]	[illegible]	[illegible]	WSP_Female_average	WSP_Fe-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin-[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey-[illegible]	[illegible]	AFB_ani-[illegible]	AFB_min-[illegible]
Polyommatus_nephohiptamenos	Lycaenidae	NA	4	4	1.00	1.0	1.0	0.0	30.5	5	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1200	800	2.00	NA	NA	NA	NA	NA	NA	NA
Polyommatus_nivescens	Lycaenidae	26	4	4	1.00	1.0	1.0	0.0	33.0	6	1.000	0	1	1	0	0	1	0	0	100	1200	4.00	1	0	0	0	0	0	1
Polyommatus_orphicus	Lycaenidae	9	3	3	1.00	1.0	1.0	0.0	33.0	6	0.577	NA	NA	NA	NA	NA	NA	NA	NA	400	1600	NA	NA	NA	NA	NA	NA	NA	NA
Polyommatus_ripartii	Lycaenidae	59	5	4	1.00	1.0	1.0	0.0	31.0	6	0.447	0	1	1	0	0	1	0	0	100	1900	4.00	1	0	0	0	0	0	0
Polyommatus_thersites	Lycaenidae	351	5	5	2.00	1.0	3.0	2.0	29.0	6	0.500	0	1	1	0	0	1	0	0	0	2200	7.00	1	0	0	0	0	0	0
Polyommatus_violetae	Lycaenidae	3	3	3	1.00	1.0	1.0	0.0	31.0	6	1.000	0	0	1	0	0	NA	NA	NA	1200	600	2.00	1	0	0	1	0	0	1
Pontia_callidice	Pieridae	69	5	5	1.50	1.0	2.0	1.0	47.0	10	0.102	0	1	0	0	0	1	0	0	0	3400	4.00	1	0	0	0	0	0	0
Pontia_chloridice	Pieridae	11	5	5	2.50	2.0	3.0	1.0	38.5	3	0.236	0	0	1	0	0	1	0	0	0	2500	6.04	NA	NA	NA	NA	NA	NA	NA
Pontia_daplidice	Pieridae	921	5	5	3.00	3.0	3.0	0.0	41.5	7	0.061	0	0	1	0	0	1	1	0	0	3000	5.53	1	0	0	0	0	0	0

species	family	range	conservation	conservation_popsize	GEN_Average	GEN_	GEN_	GEN_	WSP_Female_average		WSP_Fe-						ELT_sin-					FM_Average				AFB_honey-		AFB_an-	AFB_min-
Pontia_daplidice	Pieridae	NA	5	5	3.00	3.0	3.0	0.0	41.5	7	0.102	0	1	0	0	0	1	0	0	0	3000	0.53	1	0	0	0	0	0	0
Proterebia_phegea	Nymphalidae	5	NA	NA	1.00	1.0	1.0	0.0	46.0	4	1.000	0	1	1	0	0	1	1	0	150	1450	2.51	1	0	0	0	0	0	0
Pseudochazara_amymone	Nymphalidae	NA	3	3	1.00	1.0	1.0	0.0	53.0	2	0.289	NA	NA	NA	NA	NA	NA	NA	NA	500	1000	2.51	1	0	0	0	0	0	1
Pseudochazara_anthelea	Nymphalidae	45	5	5	1.00	1.0	1.0	0.0	51.0	4	0.289	1	1	1	0	0	NA	NA	NA	0	2400	4.02	1	0	0	0	0	0	0
Pseudochazara_cingovskii	Nymphalidae	2	1	NA	1.00	1.0	1.0	0.0	52.0	4	0.577	NA	NA	NA	NA	NA	NA	NA	NA	1000	2000	2.00	NA	NA	NA	NA	NA	NA	NA
Pseudochazara_euxina	Nymphalidae	NA	2	NA	1.00	1.0	1.0	0.0	54.5	7	NA	NA	NA	NA	NA	NA	NA	NA	NA	500	7000	3.00	NA	NA	NA	NA	NA	NA	NA
Pseudochazara_geyeri	Nymphalidae	6	5	5	1.00	1.0	1.0	0.0	49.0	2	1.000	NA	NA	NA	NA	NA	NA	NA	NA	1250	5000	2.00	1	0	0	0	0	0	0
Pseudochazara_graeca	Nymphalidae	19	5	5	1.00	1.0	1.0	0.0	51.0	2	0.289	NA	NA	NA	NA	NA	1	0	0	750	1650	3.02	1	0	0	0	0	0	0

species	family	range	conservgroup	conservsize	GEN_Average	GEN_[illegible]	GEN_[illegible]	GEN_[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_honey[illegible]	[illegible]	AFB_an[illegible]	AFB_min[illegible] flower
Pseudochazara_mercurius	Nymphalidae	6	NA	NA	1.00	1.0	1.0	0.0	50.0	4	1.000	NA	NA	NA	NA	NA	NA	NA	1400	1300	2.00	1	0	0	0	0	0	0
Pseudochazara_orestes	Nymphalidae	1	3	3	1.00	1.0	1.0	0.0	53.5	3	0.289	NA	NA	NA	NA	NA	NA	NA	300	1600	3.02	1	0	0	0	0	0	0
Pseudochazara_williamsi	Nymphalidae	5	NA	NA	1.00	1.0	1.0	0.0	50.0	4	NA	NA	NA	NA	NA	NA	NA	NA	2000	700	3.00	1	0	0	0	0	0	1
Pseudophilotes_abencerragus	Lycaenidae	27	5	5	1.50	1.0	2.0	1.0	20.0	4	0.364	0	1	0	0	NA	NA	NA	100	1400	2.00	1	0	0	0	0	0	1
Pseudophilotes_barbagiae	Lycaenidae	1	5	5	1.00	1.0	1.0	0.0	22.0	2	1.000	0	1	0	0	NA	NA	NA	700	800	4.00	1	0	0	0	0	0	0
Pseudophilotes_baton	Lycaenidae	222	5	5	1.50	1.0	2.0	1.0	24.0	4	0.124	0	1	0	0	1	0	0	100	1900	5.00	1	0	0	0	0	0	0
Pseudophilotes_bavius	Lycaenidae	20	5	5	1.00	1.0	1.0	0.0	27.0	6	0.577	0	1	0	0	1	0	0	500	1000	3.00	1	0	1	0	0	0	0
Pseudophilotes_panoptes	Lycaenidae	41	4	4	2.00	2.0	2.0	0.0	21.5	1	0.500	NA	NA	NA	NA	NA	NA	NA	200	1700	6.00	1	0	0	0	0	0	1
Pseudophilotes_vicrama	Lycaenidae	212	4	4	1.50	1.0	2.0	1.0	23.0	6	0.069	0	1	0	0	NA	NA	NA	0	2000	5.00	1	0	0	0	0	0	0
Pyrgus_alveus	Hesperiidae	476	5	5	1.00	1.0	1.0	0.0	28.5	7	0.364	0	1	0	0	1	0	0	0	2300	3.53	1	0	0	0	0	0	0
Pyrgus_andromedae	Hesperiidae	83	5	5	1.00	1.0	1.0	0.0	28.5	5	0.289	NA	NA	NA	NA	NA	NA	NA	1600	1700	3.02	1	0	0	0	0	0	0

species	family	range	con-serv...	con-ser...	GEN_Average	GEN_...	GEN_...	GEN_...	WSP_Female_average	WSP_Fe...	HS...		LEVEL...	LEVEL...	LEVEL...	LEVEL...	...	...	...	ELT_sin...	ELT...	FM_Average	...	...	...	...	AFB_...	AFB_...	AFB_min...
Pyrgus_armoricanus	Hesperiidae	3111	5	5	1.50	1.0	2.0	1.0	26.0	4	0.10	83	0	1	1	0	1	0	0	0	1900	5.55	1	0	0	0	0	0	1
Pyrgus_cacaliae	Hesperiidae	55	5	5	1.00	1.0	1.0	0.0	28.5	5	0.57	NA	NA	NA	NA	NA	NA	NA	NA	1800	1000	2.51	1	0	0	0	0	0	0
Pyrgus_carlinae	Hesperiidae	30	5	5	1.00	1.0	1.0	0.0	29.0	6	0.50	NA	NA	NA	NA	NA	NA	NA	NA	1500	1000	2.00	1	0	0	0	0	0	0
Pyrgus_carthami	Hesperiidae	264	5	5	1.00	1.0	1.0	0.0	32.0	4	0.20	18	1	1	0	0	1	1	0	0	1800	5.00	1	0	0	0	0	0	1
Pyrgus_centaureae	Hesperiidae	162	5	5	1.00	1.0	1.0	0.0	29.5	5	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	1000	2.51	1	0	0	0	0	0	0
Pyrgus_cinarae	Hesperiidae	14	5	5	1.00	1.0	1.0	0.0	31.0	2	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	2000	4.02	1	0	0	0	0	0	0
Pyrgus_cirsii	Hesperiidae	94	3	3	1.00	1.0	1.0	0.0	27.0	2	0.40	8	1	1	0	0	1	0	0	0	1000	3.02	1	0	0	0	0	0	1
Pyrgus_foulquieri	Hesperiidae	29	NA	NA	1.00	1.0	1.0	0.0	28.5	3	0.50	NA	NA	NA	NA	NA	NA	NA	NA	1000	700	3.02	1	0	0	0	0	0	0
Pyrgus_malvae	Hesperiidae	959	5	5	1.50	1.0	2.0	1.0	23.0	6	0.10	92	0	1	0	0	1	0	0	0	2500	5.04	1	0	0	0	0	0	0
Pyrgus_malvoides	Hesperiidae	NA	5	5	1.50	1.0	2.0	1.0	23.0	6	NA	0	1	1	0	0	1	0	0	0	1800	3.53	1	0	0	0	0	0	1
Pyrgus_onopordi	Hesperiidae	105	5	5	2.50	2.0	3.0	1.0	25.0	6	0.50	77	1	1	0	0	1	0	0	0	2800	7.00	1	0	0	0	0	0	1

species	family	range	conserv-	conser-	GEN_Average	GEN_	GEN_	GEN_	WSP_Female_average	WSP_Fe-						ELT_sin-					FM_Average					AFB_honey-	AFB_an-	AFB_min-
Pyrgus_serratulae	Hesperiidae	318	5	4	1.00	1.0	1.0	0.0	28.0	8	0.3016	1	1	0	0	1	0	0	0	2800	3.02	1	0	0	0	0	0	0
Pyrgus_sidae	Hesperiidae	77	5	5	1.00	1.0	1.0	0.0	35.0	6	0.316	NA	NA	NA	NA	NA	NA	NA	0	2300	4.02	1	0	0	0	0	0	1
Pyrgus_warrenensis	Hesperiidae	29	5	5	1.00	1.0	1.0	0.0	24.5	3	0.577	NA	NA	NA	NA	NA	NA	NA	1800	800	2.00	NA	NA	NA	NA	NA	NA	NA
Pyronia_bathseba	Nymphalidae	104	5	5	1.00	1.0	1.0	0.0	37.0	2	0.3554	1	1	0	0	1	0	0	100	1900	4.51	1	0	0	0	0	0	0
Pyronia_cecilia	Nymphalidae	219	5	5	1.00	1.0	1.0	0.0	31.0	2	0.1077	0	1	0	0	1	0	0	0	2300	3.51	1	0	0	0	0	0	1
Pyronia_tithonus	Nymphalidae	515	5	5	1.00	1.0	1.0	0.0	36.0	4	0.0881	1	1	0	0	1	0	0	0	2300	3.53	1	0	1	0	0	0	0
Satyrium_acaciae	Lycaenidae	349	5	5	1.00	1.0	1.0	0.0	30.0	4	1.0000	1	0	1	0	1	0	0	0	2000	3.02	1	0	1	0	0	0	0
Satyrium_esculi	Lycaenidae	106	5	5	1.00	1.0	1.0	0.0	32.0	4	0.7077	0	0	1	1	1	0	0	100	1200	4.00	1	0	0	0	0	0	0
Satyrium_ilicis	Lycaenidae	586	5	5	1.00	1.0	1.0	0.0	34.0	4	0.1012	0	0	1	0	1	0	0	0	1800	4.00	0	0	1	0	0	0	0
Satyrium_ledereri	Lycaenidae	1	NA	NA	1.00	1.0	1.0	0.0	29.0	4	0.5077	0	0	1	0	1	0	0	600	1900	3.53	1	0	0	0	0	0	0
Satyrium_pruni	Lycaenidae	408	5	5	1.00	1.0	1.0	0.0	31.5	9	0.1634	0	0	1	0	1	0	0	100	600	3.00	1	0	1	1	0	0	0
Satyrium_spini	Lycaenidae	483	5	5	1.00	1.0	1.0	0.0	30.0	4	0.1667	0	0	1	0	1	1	0	0	2000	3.51	1	0	1	1	0	0	0
Satyrium_w-album	Lycaenidae	553	5	5	1.00	1.0	1.0	0.0	30.0	4	0.0665	0	0	1	1	1	0	0	0	1700	3.00	1	0	0	1	0	0	0

species	family	range	conservation		GEN_Average				WSP_Female_average	WSP_Fe…										ELT_sin…	FM_Average				AFB_…ey		AFB_min…	
Satyrus_actaea	Nymphalidae	73	5	5	1.00	1.0	1.0	0.0	55.0	10	0.236	1	1	0	0	1	0	0	100	1900	3.00	1	0	0	0	0	0	0
Satyrus_ferula	Nymphalidae	14	5	5	1.00	1.0	1.0	0.0	55.0	10	0.500	1	1	0	0	0	1	0	0	2200	4.02	1	0	0	0	0	1	1
Scolitantides_orion	Lycaenidae	260	5	4	1.50	1.0	2.0	1.0	27.5	5	0.333	0	1	0	0	1	0	0	0	1500	5.00	1	0	0	0	0	0	0
Speyeria_aglaja	Nymphalidae	1132	5	5	1.00	1.0	1.0	0.0	51.5	9	0.500	1	1	0	0	1	0	0	0	2500	3.53	1	0	0	0	0	1	1
Spialia_orbifer	Hesperiidae	129	5	5	1.50	1.0	2.0	1.0	25.0	6	0.224	NA	NA	NA	NA	NA	NA	NA	0	2500	5.53	1	0	0	0	0	0	0
Spialia_phlomidis	Hesperiidae	25	5	5	1.00	1.0	1.0	0.0	27.0	6	0.500	NA	NA	NA	NA	NA	NA	NA	0	2200	4.00	NA	NA	NA	NA	NA	NA	NA
Spialia_rosae	Lycaenidae	NA	NA	NA	3.00	3.0	3.0	0.0	20.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	0	1400	NA	NA	NA	NA	NA	NA	NA	NA
Spialia_sertorius	Hesperiidae	380	5	5	2.00	1.0	3.0	2.0	24.0	4	1.000	1	1	0	0	1	0	0	0	1700	7.04	1	0	0	0	0	0	0
Spialia_therapne	Hesperiidae	7	5	5	2.00	2.0	2.0	0.0	24.0	4	1.000	1	1	0	0	1	0	0	0	1500	5.00	NA	NA	NA	NA	NA	NA	NA
Tarucus_balkanicus	Lycaenidae	19	5	5	3.00	3.0	3.0	0.0	20.0	4	0.267	0	1	0	0	1	0	0	0	1200	7.00	1	0	0	0	0	0	0
Tarucus_theophrastus	Lycaenidae	4	5	5	3.00	3.0	3.0	0.0	21.0	2	0.354	0	0	1	0	1	0	0	0	250	6.00	NA	NA	NA	NA	NA	NA	NA

species	family	range	conservation		GEN_Average				WSP_Female_average	WSP_Fe...						ELT_sin...						FM_Average				AFB_...		AFB_an...	AFB_min...
Thecla_betulae	Lycaenidae	628	5	5	1.00	1.0	1.0	0.0	35.0	10	0.129	0	0	0	1	0	1	0	0	0	1600	4.51	1	0	0	1	0	0	0
Thymelicus_acteon	Hesperiidae	496	4	4	1.50	1.0	2.0	1.0	24.0	4	0.108	1	0	1	0	0	0	1	0	0	2500	4.53	1	0	0	0	0	0	0
Thymelicus_christi	Hesperiidae	NA	5	5	2.50	2.0	3.0	1.0	24.0	4	NA	0	0	1	0	0	NA	NA	NA	100	900	9.00	NA	NA	NA	NA	NA	NA	NA
Thymelicus_hyrax	Hesperiidae	10	5	5	1.00	1.0	1.0	0.0	32.5	5	0.102	NA	NA	NA	NA	NA	NA	NA	NA	0	2000	3.00	1	0	0	0	0	0	0
Thymelicus_lineola	Hesperiidae	926	5	5	1.00	1.0	1.0	0.0	25.5	7	0.067	6	0	1	0	0	0	1	1	0	2500	3.53	1	0	0	0	0	0	1
Thymelicus_sylvestris	Hesperiidae	832	5	5	1.00	1.0	1.0	0.0	26.5	5	0.101	0	0	1	0	0	0	1	0	0	2600	4.53	1	0	0	0	0	0	1
Tomares_ballus	Lycaenidae	51	5	5	1.00	1.0	1.0	0.0	29.0	2	0.125	0	0	1	0	0	1	0	0	200	1100	4.02	1	0	0	0	0	0	0
Tomares_callimachus	Lycaenidae	NA	5	NA	1.00	1.0	1.0	0.0	28.0	4	NA	1	1	1	0	0	1	0	0	0	2300	3.00	NA	NA	NA	NA	NA	NA	NA
Tomares_nogelii	Lycaenidae	2	3	0	1.00	1.0	1.0	0.0	32.5	5	1.000	NA	NA	NA	NA	NA	NA	NA	NA	0	2300	3.51	NA	NA	NA	NA	NA	NA	NA
Turanana_taygetica	Lycaenidae	3	2	2	1.50	1.0	2.0	1.0	21.0	2	0.577	NA	NA	NA	NA	NA	NA	NA	NA	1500	800	4.00	1	0	0	0	0	0	1
Vanessa_atalanta	Nymphalidae	1343	[illegible]	5	2.00	1.0	3.0	2.0	59.5	13	0.306	1	0	1	0	0	1	0	0	0	2500	8.57	1	0	1	1	1	1	1
Vanessa_cardui	Nymphalidae	1373	[illegible]	5	2.00	1.0	3.0	2.0	54.0	16	0.083	0	0	1	0	0	1	0	0	0	3000	8.08	1	0	1	1	0	0	0

species	family	range	conservation	conser…size	GEN_Average	GEN_…	GEN_…	GEN_…	WSP_Female_average	WSP_Fe…						ELT_sin…					FM_Average				AFB_…	AFB_mon…	AFB_an…	AFB_min…
Vanessa_virginiensis	Nymphalidae	12	NA	NA	3.00	3.0	3.0	0.0	45.0	10	0.048	0	1	0	0	1	0	0	0	1500	10.00	NA	NA	NA	NA	NA	NA	NA
Vanessa_vulcania	Nymphalidae	NA	5	5	3.00	3.0	3.0	0.0	57.0	6	0.289	0	1	0	0	1	0	0	0	1500	12.00	1	0	0	0	0	0	0
Ypthima_asterope	Nymphalidae	2	NA	NA	3.00	3.0	3.0	0.0	30.0	4	0.500	0	1	0	0	1	0	0	0	1200	7.51	1	0	0	0	0	0	0
Zegris_eupheme	Pieridae	36	4	4	1.00	1.0	1.0	0.0	48.5	5	0.192	0	1	0	0	1	0	0	500	900	4.00	1	0	0	0	0	0	0
Zerynthia_cassandra	Papilionidae	44	NA	NA	1.00	1.0	1.0	0.0	49.0	6	0.577	0	1	0	0	1	1	0	0	1700	4.00	1	0	0	0	0	0	0
Zerynthia_cerisy	Papilionidae	61	4	4	1.00	1.0	1.0	0.0	57.0	10	0.354	0	1	0	0	0	1	0	0	1700	5.00	1	0	0	0	0	0	0
Zerynthia_cretica	Papilionidae	7	5	5	1.00	1.0	1.0	0.0	52.5	5	0.707	0	1	0	0	1	1	0	0	1000	4.51	1	0	0	0	0	0	0
Zerynthia_polyxena	Papilionidae	215	5	5	1.00	1.0	1.0	0.0	49.0	6	0.500	0	1	0	0	1	1	0	0	1700	4.00	1	0	0	0	0	0	0
Zerynthia_rumina	Papilionidae	128	5	5	1.25	1.0	1.5	0.5	45.0	2	0.577	1	1	0	0	1	1	0	0	1500	5.04	1	0	0	0	0	0	0
Zizeeria_karsandra	Lycaenidae	NA	NA	NA	3.00	3.0	3.0	0.0	22.0	4	0.289	NA	NA	NA	NA	NA	NA	NA	0	1500	NA	NA	NA	NA	NA	NA	NA	NA
Zizeeria_knysna	Lycaenidae	39	NA	NA	3.00	3.0	3.0	0.0	22.0	4	0.105	NA	NA	NA	NA	NA	NA	NA	0	800	9.00	1	0	0	0	0	0	1

```r
# contains is another useful command to select columns.
be %>%
  select(species, contains("LEV")) %>%
  drop_na()
```

species	LEV_buried	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_zullichi	1	1	1	0	0
Anthocharis_cardamines	0	0	1	0	0
Anthocharis_euphenoides	0	0	1	0	0
Apatura_ilia	0	0	0	1	1
Apatura_iris	0	0	0	1	0
Apatura_metis	0	0	0	1	1
Aphantopus_hyperantus	0	1	1	0	0
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_agestis	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_morronensis	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	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	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Coenonympha_rhodopensis	0	0	1	0	0
Coenonympha_thyrsis	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_lorquinii	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
Cyclyrius_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	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_maturna	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	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_morpheus	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_feisthamelii	0	0	0	1	0
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_psylorita	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	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Lasiommata_paramegaera	0	0	1	0	0
Lasiommata_petropolitana	0	0	1	0	0
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_halicarnassus	0	1	1	0	0
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	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_antiopa	0	0	0	1	1
Nymphalis_polychloros	0	0	0	1	1
Nymphalis_vaualbum	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	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_argyrognomon	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_amandus	0	1	1	0	0
Polyommatus_aroaniensis	0	0	1	0	0
Polyommatus_damon	0	1	0	0	0
Polyommatus_daphnis	0	1	1	0	0
Polyommatus_dorylas	0	1	1	0	0
Polyommatus_eros	0	0	1	0	0
Polyommatus_escheri	0	1	1	0	0
Polyommatus_fabressei	0	0	1	0	0
Polyommatus_fulgens	0	0	1	0	0
Polyommatus_golgus	1	1	1	0	0
Polyommatus_icarus	0	1	1	0	0

species	LEV_buried	LEV_ground_layer	LEV_field_layer	LEV_shrub_layer	LEV_canopy_layer
Polyommatus_nivescens	0	1	1	0	0
Polyommatus_ripartii	0	1	1	0	0
Polyommatus_thersites	0	1	1	0	0
Polyommatus_violetae	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_anthelea	1	1	1	0	0
Pseudophilotes_abencerragus	0	0	1	0	0
Pseudophilotes_barbagiae	0	0	1	0	0
Pseudophilotes_baton	0	0	1	0	0
Pseudophilotes_bavius	0	0	1	0	0
Pseudophilotes_vicrama	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	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

Funtions 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

```r
# 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()
```

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

```r
# 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)
```

species	family	[illegible]	conserv.europe	conserv.eu	OWS_egg	OWS_[illegible]	OWS_pupa	OWS_[illegible]	GEN_[illegible]	[illegible]	GEN_Average	[illegible]	WSP_Female_average	WSP_Fe[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	ELT_sin[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FM_Average	[illegible]	[illegible]	[illegible]	AFB_Av[illegible]	AFB_[illegible]	AFB_[illegible]	AFB_pro[illegible]	protect_diff
Coenonympha_oedippus	Nymphalidae	522	1	5	0	1	0	0	1.00	1	1.00	0.0	38.8	0	0.25	580	1	0	0	1	0	0	0	500	3.00	1	0	1	1	0	0	0	3
Lycaena_helle	Lycaenidae	148	2	5	0	0	1	0	1.25	5	1.5	0.5	24.6	0	0.28	390	1	0	0	1	0	0	100	1700	6.00	1	0	1	0	0	0	0	3
Tomares_nogelii	Lycaenidae	2	3	0	NA	NA	NA	NA	1.00	1	1.00	0.0	32.5	5	1.00	NA	NA	NA	NA	NA	NA	NA	NA	0	2300	51	NA	NA	NA	NA	NA	NA	NA	3

4.8 Exercise

a) 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?

b) 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 summarize() 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

a) If butterflies overwintering as pupae have higher level of legal protection

b) If butterflies occuring at higher altitudes on average have a higher level of protection

c) If feeding on honeydew is more common in larger butterflies.

d) 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 correpond 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

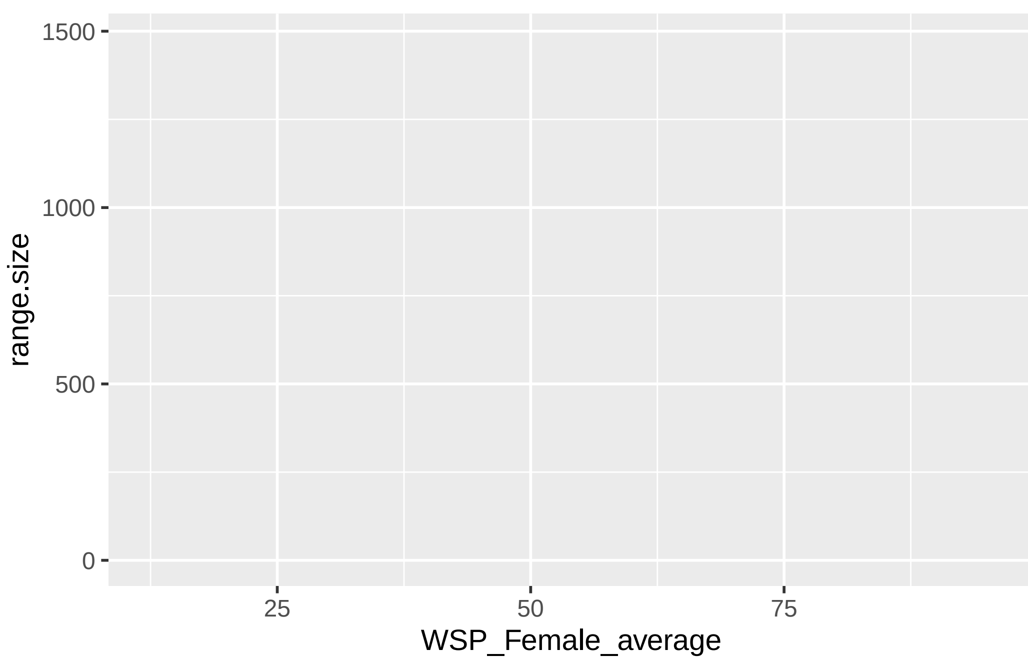
We will start off with a very simple scatterplot and gradually increase the complexity to illustrate `ggplot2` functionality.

```
# 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 becom
```

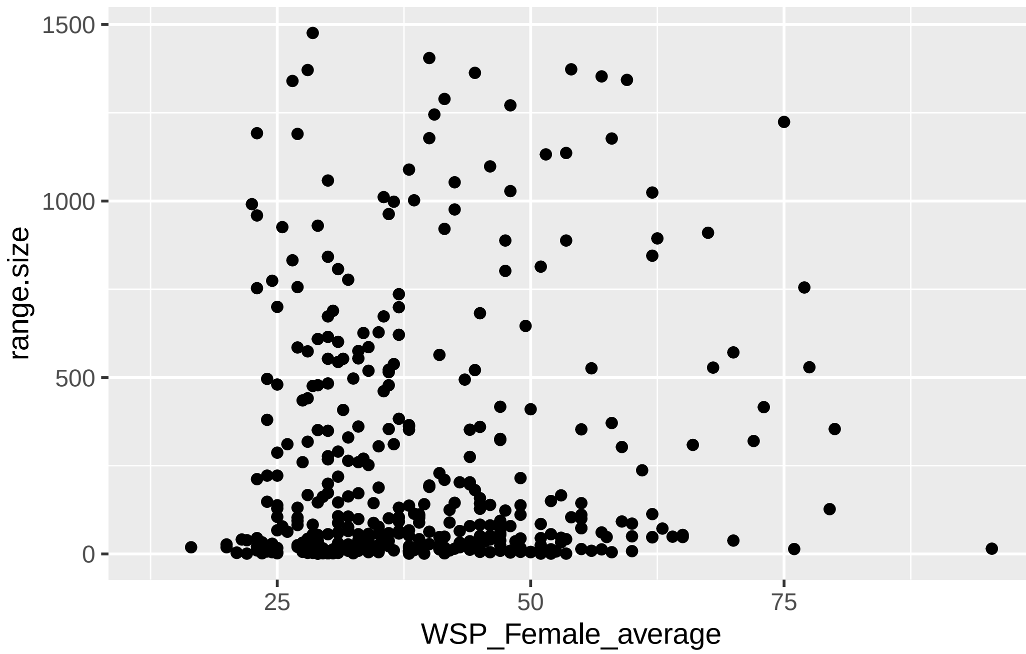
```r
be <-  read.table("data/butterfly_ecology.csv", header = TRUE, sep = ",")

# 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?

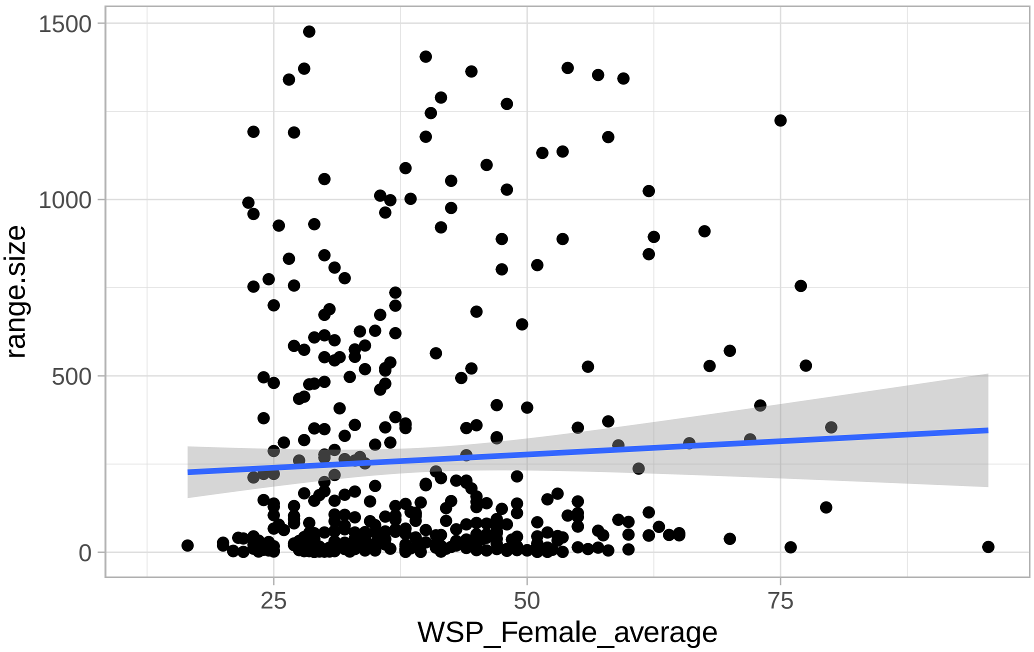
```r
# simple scatter plot
be %>%                                # DATA
  ggplot(aes(x = WSP_Female_average, # Aesthetics
             y = range.size)) +
  geom_point()                        # Geometric object
```



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:

```r
# 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'
```



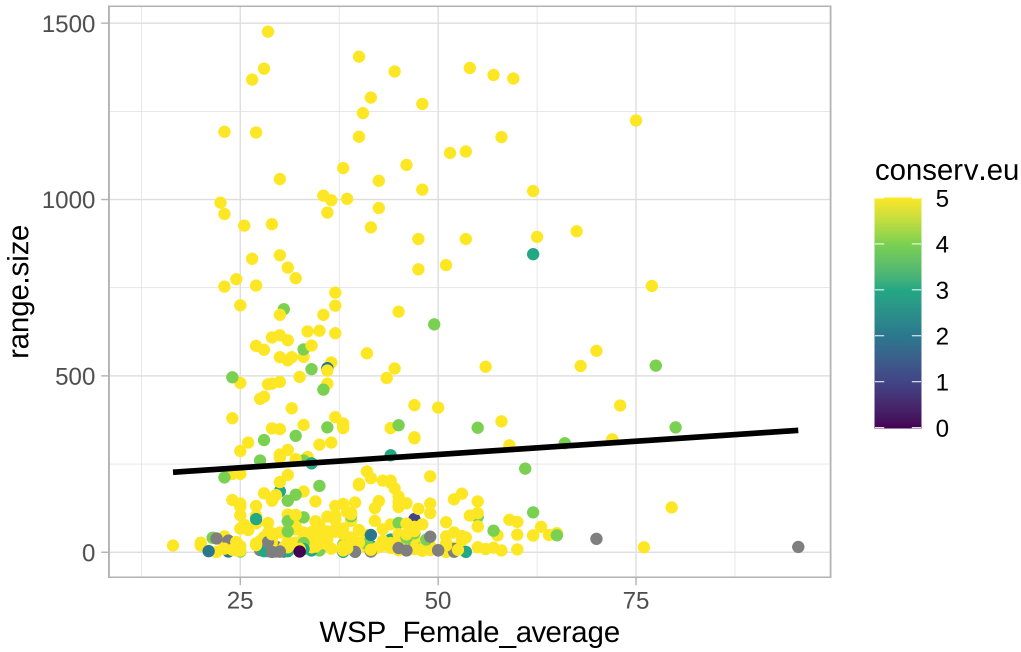
Changing the theme changes many layout options. For different applications, different themes might be appropriate. There are many additional themes available through packages such as ggthemr or ggthemes.

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 sonservation 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'
```



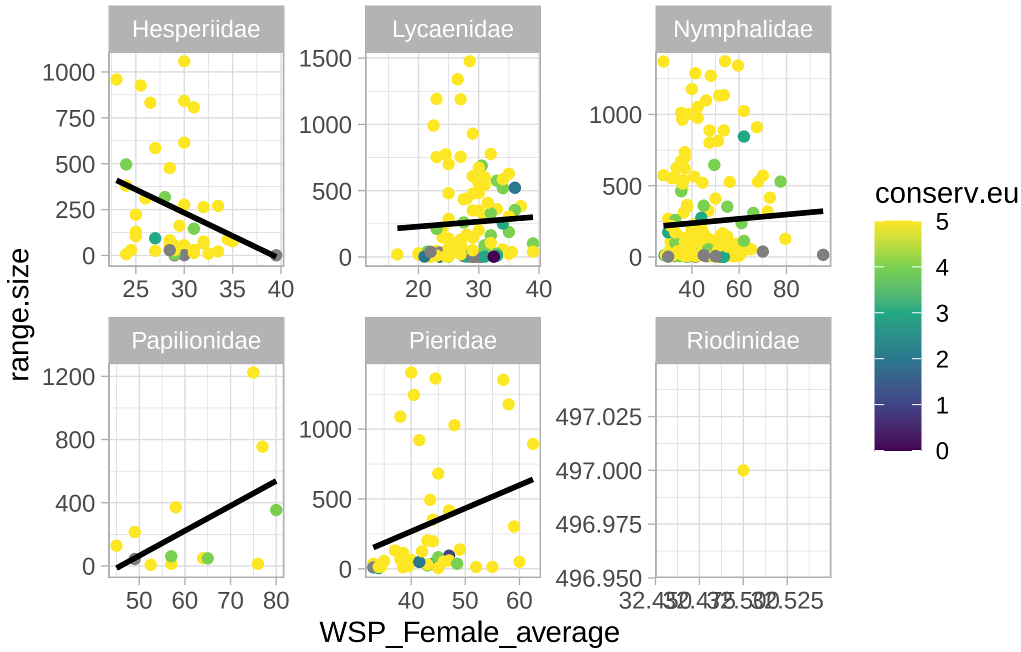
Aesthetics can be added through colors or shapes

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.

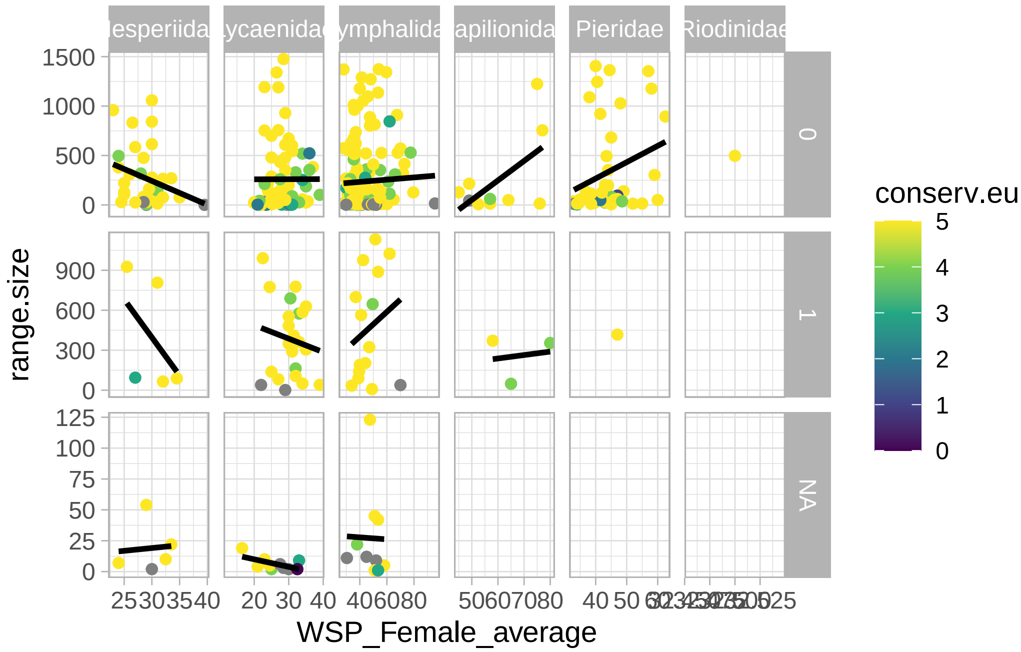
```
# Same example as before, faceted over family
be %>%
  ggplot(aes(x = WSP_Female_average,
             y = range.size)) +
  geom_point(aes(color = conserv.eu)) +
  geom_smooth(method = "lm",
              color = "black",
              se = FALSE) +
  theme_light() +
  scale_color_viridis_c() +
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

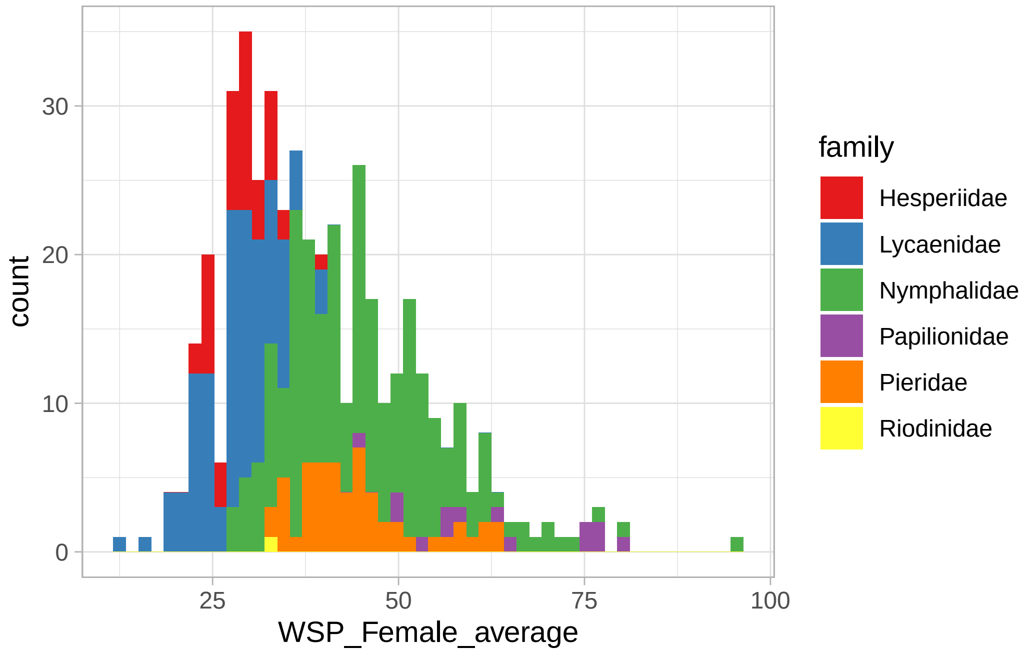


The above plot would need a little 'cleaning up'. How would you do that?

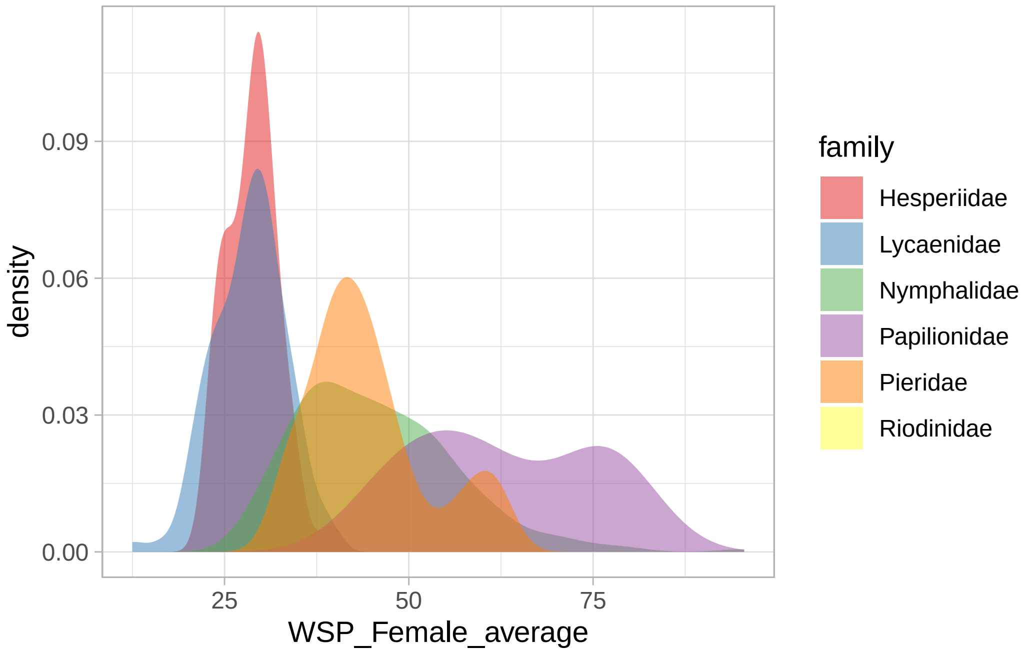
5.4 Some common plot types

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

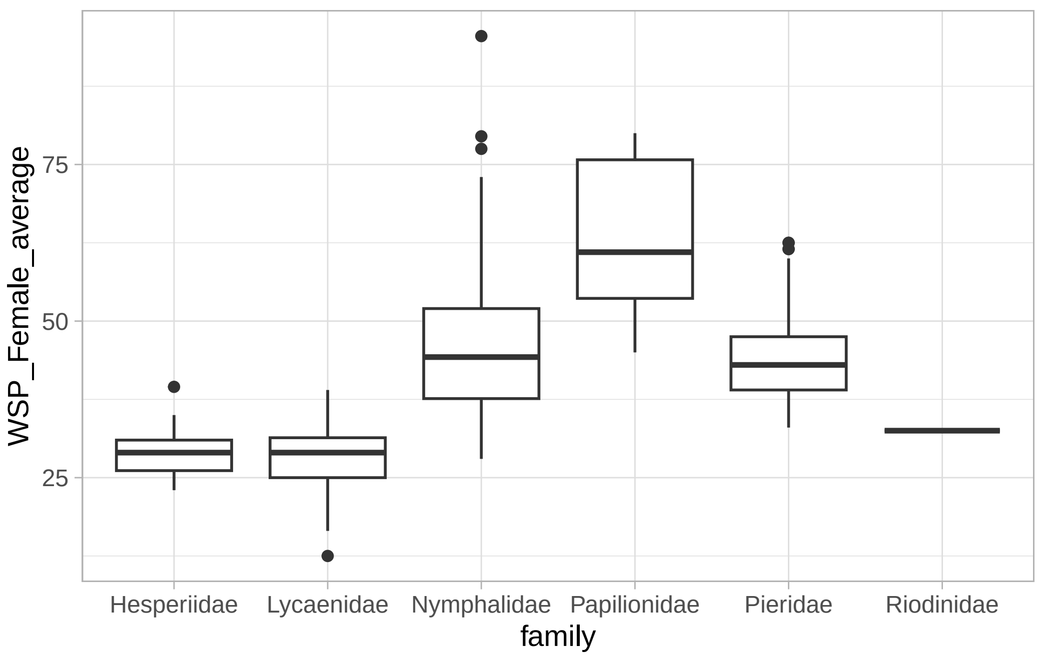
```
# histograms
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_histogram(bins = 50) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```



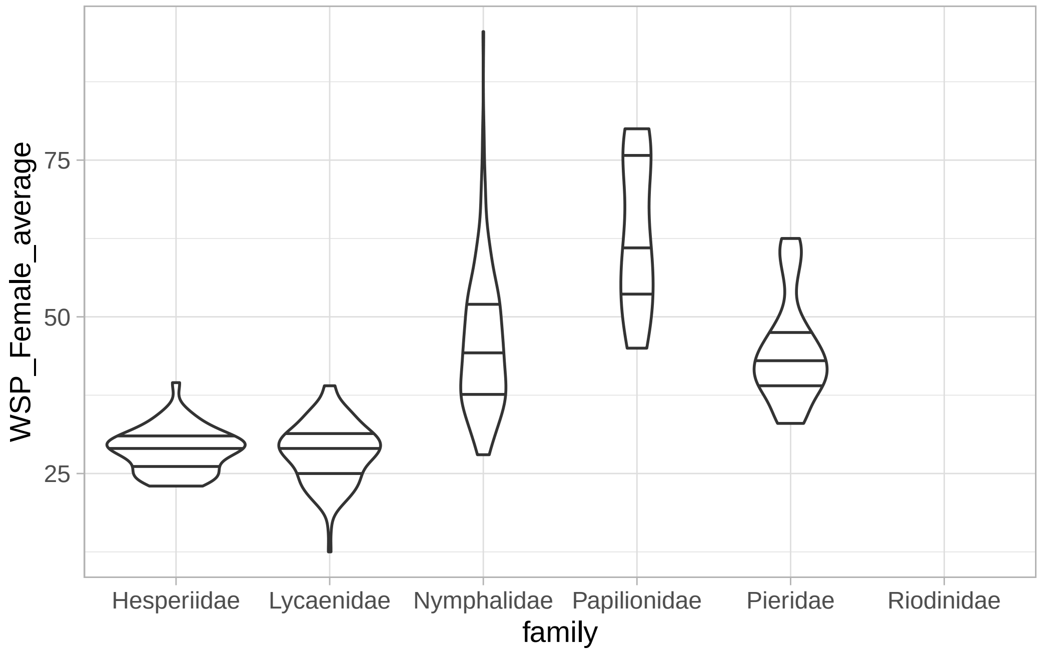

```
# better alternative are often density plots
be %>%
  ggplot(aes(x = WSP_Female_average, fill = family)) +
  geom_density(alpha = 0.5, colour = NA) +
  theme_light() +
  scale_fill_brewer(palette = "Set1")
```




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



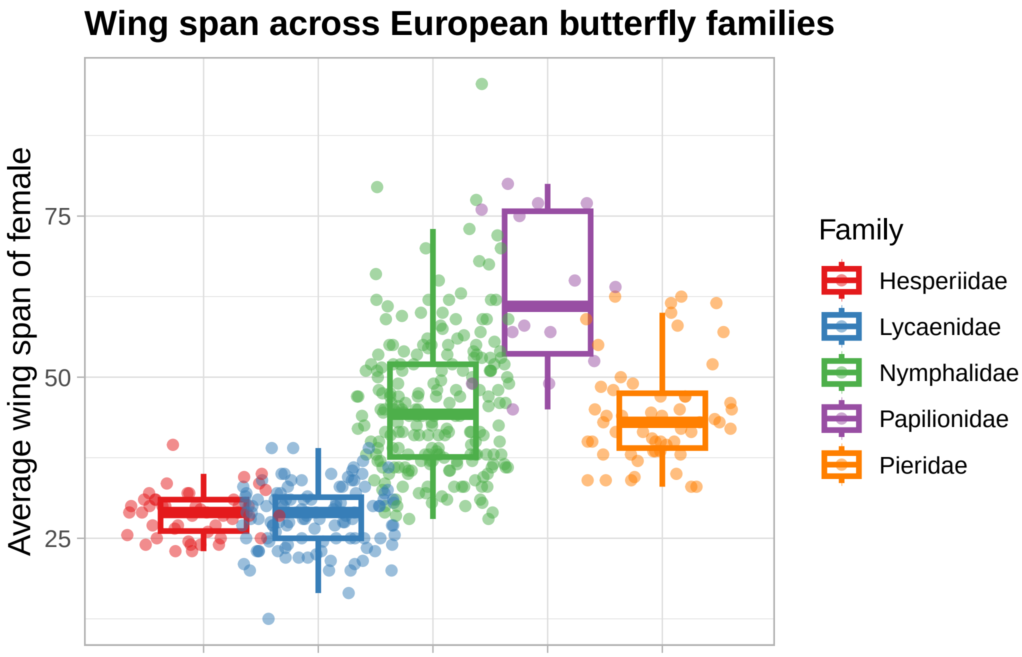

```
# better alternative are violin plots
be %>%
  ggplot(aes(y = WSP_Female_average, x = family)) +
  geom_violin(draw_quantiles = c(0.25, 0.5, 0.75)) +
  theme_light()
```



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")
```



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

6 Introduction to Linux Environment and Command Line.

6.1 The Unix / Linux environment

Unix and Linux (a variant of Unix) are operating systems (like Windows or macOS). They belong to a "family" of operating systems that share a common ancestor, have been around since 1969 and it's not likely to disappear any time soon.

- Commonly used among the scientific and technical community (e.g. servers and scientific clusters).
- macOS is Unix-based system.
- Most supercomputers are powered by Unix-like operating systems.

6.2 Why learn Unix command line?

- Is the foundation of scientific computing (e.g. bioinformatics and data analysis)
- Powerful for working on large datasets and files
- Helps automate repetitive tasks (e.g. imagine you need to need to rename or modify 1,000 files?)
- Enables use of higher-powered computers elsewhere (clusters and servers/cloud-computing)

6.3 Some terminology

Figure 6.1: image1.png

As a user you can "communicate" with your Linux system either by a **G**raphical **U**ser **I**nterface (**GUI**) or by typing instructions (commands) using a **C**ommand **L**ine **I**nterface (**CLI**). At first it might look quite complex and confusing but once you understand the concept and the basics then its quite simple and intuitive!

Command Line: is the written instructions we type.

Terminal: also known as terminal emulator is the text-based environment (software) capable of taking input and providing output.

Shell: a program that interprets command-line input and executes commands. There are different shells available e.g bash, zsh, sh, csh etc. Each of them offering unique features and functionalities. Some are more basic and some are more fancy but all serve the same purpose, to interpret the commands provided by the user and output the results. The most commonly used is the **bash** shell.

6.4 Some important rules

1. **Be aware of the case!** The command line is case sensitive so be careful when typing. For example, typing `Echo` is not the same as `echo`, nor are the directory names "`/Results`" and "`/results`".
2. **Spaces are having special use!** The command line uses spaces as separators between arguments. Using spaces in filenames or directory names will certainly cause problems sooner or later. Avoid using names that contain spaces, but rather it's better to use

dashes (`-`) or underscores (`_`). e.g., “`results_2026.txt`” is preferred over “`results 2026.txt`”.

3. Apart from spaces there are several other characters (special characters) that can be used to perform special operations. See some examples bellow.

Character	**Description**
/	Directory separator, used to separate a string of directory names. Example: /usr/src/linux
\	Escape — (backslash) prevents the next character from being interpreted as a special character. This works outside of quoting, inside double quotes, and generally ignored in single quotes.
.	Current directory. Can also “hide” files when it is the first character in a filename.
..	Parent directory
~	The tilde is a representation of the current user’s home directory.
*	Represents 0 or more characters in a filename, or by itself, all files in a directory.
?	Represents a single character in a filename.
$	Expansion — introduces various types of expansion: parameter expansion (e.g. $var or ${var}), command substitution (e.g. $(command)), or arithmetic expansion (e.g. $((expression))). More on expansions later.
[ ]	Can be used to represent a range of values, e.g. [0-9], [A-Z], etc. Example: hello[0-2].txt represents the names hello0.txt, hello1.txt, and hello2.txt
|	Pipe — send the output from one command to the input of another command. This is a method of chaining commands together. Example: echo “Hello beautiful.” | grep -o beautiful.
>	Redirect output of a command into a new file. If the file already exists, over-write it. Example: ls > myfiles.txt
»	Redirect and appends the output of a command onto the end of an existing file.
<	Redirect a file as input to a program.

Character	Description
;	Command separator. Allows you to execute multiple commands on a single line. Example: cd /var/log ; ls -l
&&	Command separator as above, but only runs the second command if the first one finished without errors.
&	Background – when used at the end of a command, run the command in the background (do not wait for it to complete).
#	Comment — the # character begins a commentary that extends to the end of the line. Comments are notes of explanation and are not processed by the shell.

6.5 Accessing your Terminal

You are using a **Kubuntu** Linux system. In Kubuntu, the terminal emulator is called **Konsole**. You can start it in any of the following ways:

1. Press **Ctrl + Alt + T** to open **Konsole** instantly.
2. Open the **Krunner** by pressing **Alt + Space**, type **Konsole**, then press **Enter**.
3. Open the **Application Launcher → System → Konsole**.

Now you are ready to start typing your first commands!

7 Part 1. Your first Unix commands - Navigating the Unix File-System Structure

What will be cover:

1. The Unix file-system structure and how to navigate
2. Some general rules
3. Relative vs absolute path
4. Running some basic commands and general syntax

Unix systems, like most operating systems, store file locations in a hierarchical structure. In the UNIX file-system each file and directory has its own "address", and that address is called a "**path**".

There are two special locations in all Unix-based systems That you should be familiar. The "**root**" location is where the address system of the computer starts. The "**home**" location is where the current user's location starts.

By default every time you open a new terminal you start in your own "**home**" directory(containing files and directories that only you can modify). The path of home directory is usually represented by the "~" character.

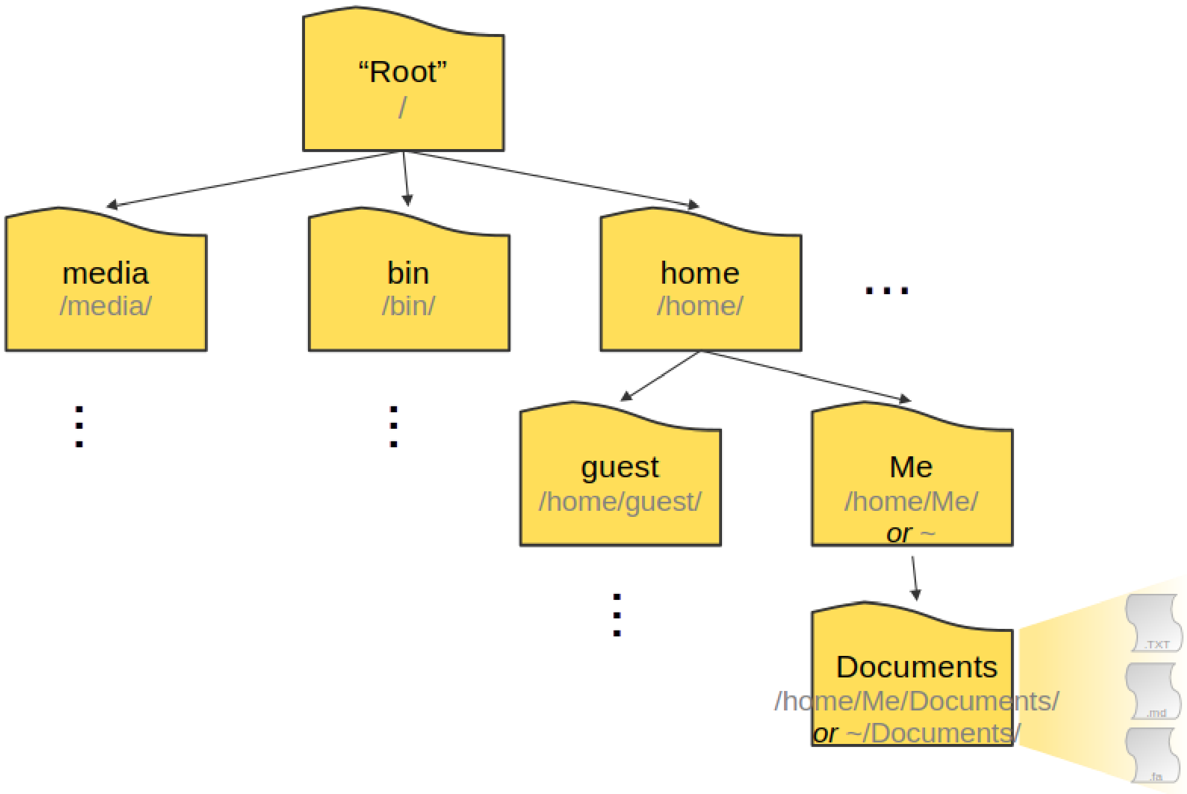


Figure 7.1: image2.png

Basic commands we will use

Command	Description
`pwd`	print working directory
`ls`	list items in directory
`cd`	change directory
`cd ..`	go one level up
`ls -l`	long format listing
`ls -lh`	human readable sizes

7.1 Finding out where you are

The `pwd` command in Linux is short for ***print working directory***. It's only function is to print the absolute path of the current directory. It's handy when you're not exactly sure what directory you're in. So make it a good habit to get used to running the **`pwd`** command a lot.

```
# Example. Try running pwd. What do you see?
pwd
# What do you see if you run PWD instead?
PWD
# Try now to run this "echo $PWD". The command echo just prints the parameters we give it. Th
echo $PWD
```

7.2 The command `ls`

`ls` is short for *list*, and is used to list the files and sub-directories in your present working directory or some other directory if you specify one.

```
# Examples
# List the files and directories in your current directory
ls
# or
ls .
# ls can accept several options. Try running the following commands and observe how their out
ls -l
# or
ls -lh
# You can use ls to list the contents of any directory. Try the following.
ls -l /etc
```

Note

I. The anatomy of a command (or command syntax)
Each command is usually composed of three parts:

1. **The command** itself
2. **The options:** These are optional parameters that can be used to customise the behavior of a command. (e.g. on the previous examples `ls -l` shows the list of files in a long format)
3. **The arguments:** specify the target of the command. (e.g. on the previous example `ls -l /etc` you instructed the command to list the contents of the **/etc** directory)

II. Getting help
Most Unix commands can accept several parameters. How do we know which ones to use and why? Luckily, most Unix commands have built-in help documentation that we can access by providing *–help* as the only argument.

> Try for example: `ls --help`
> Another way to access the documentation for a command is by using the `man` command and providing the command's name as an argument. For example:
> `man ls`

7.3 Relative vs absolute path and getting help

There are two ways to specify the path (the file's address on the computer):

- An **absolute path** starts from a fixed location, either the root directory (/) or the home directory (~/). Note: A "full path" usually refers to an absolute path that starts from the root (/).
- A **relative path** starts from your current directory.

  When working at the command line, it's important to always be aware of your current location in the system. One of the most common mistakes is trying to operate on a file that isn't where you think it is. To avoid this, it's good practice to use absolute paths, which clearly specify a file's exact location regardless of where you are.

7.4 Moving around

One of the most commonly used commands in Linux is the ***change directory*** command, or `cd`. It allows you to change your working directory from the current location to another directory you want to navigate to. The `cd` command takes a positional argument: the path (address) of the directory you want to move into. This path can be either **absolute** or **relative**. Let's try moving from our current directory to a directory present in your home directory called *Documents*.

```
# The relative way
cd Documents
# The absolute way (~ stands for /home/<user>/). Can you see the change in your command promp
cd ~/Documents
# But how do we go back "up" to the parent directory? We can use the ".." special characters
cd ..
# When you need to navigate back to the previous working directory from the current working
cd -
# Note: running the cd command without any arguments will always bring you back to your home
cd
```

7.5 Exercise

Practice moving around the filesystem with `cd` and listing directory contents with `ls`, including navigating by relative and absolute paths or using special characters ".." . Use `pwd` frequently to see your current working directory. Practice navigating home with `cd`.

8 Part 2. Working with Files and Directories

What we will cover:

1. Working with simple text files
2. Working with directories
3. Intro to a command-line text editor

8.1 Creating new directories and files

You can create a new directory using the **mkdir** command. It takes as a parameter a relative or absolute path to the directory to create

```
# Let's try some examples. From your home directory navigate to Documents/ and create 2 new r
pwd
cd Documents
mkdir projects
cd projects
mkdir projects1
pwd
# Try to create a new directory with the same name e.g. projects1. What do you see?
```

Exercise

In the previous example we created the two directories in two separate steps. Can we do it in one step instead? (check the help page for **mkdir** command).

Now that we saw how to create a new directory lets see how we can create a new file. There are several ways to do this in Linux command line but we will start with the basic one. The command **touch** will create a new, empty file.

```
# Create an Empty File within the new directory project1.
touch notes.txt
# can you do it if you are outside the project1 directory?
```

8.2 Move or Rename a File or Directory

The **mv** command serves for both moving and renaming files and directories. Works by specifying a “source_path” and a “destination_path”, wheres “source_path” is the path (absolute or relative) of the file/directory to move or rename, and “destination_path” is the new name or location to give it.

Copying files and directories is similar operation, except that the original file or directory is not removed! We will use the **cp** command for this.

> NOTE: copying, moving or renaming files at the command line will overwrite files if they have the same name!!

Let’s try them both.

```
# move the notes.txt file one directory up assuming your current directory is project1
mv notes.txt ../notes.txt
# rename the notes.txt to README.txt
mv ../notes.txt ../README.txt
# copy the README.txt file to project1 directory as README1.txt
cp ../README.txt ./README1.txt
```

Exercise

Try to make a copy of the complete project1 directory on the same parent location with the name project2. What do you see?

> **i** Note
>
> **Wildcards: friend and foe at the command prompt.**
> As we saw earlier some characters have special use in Unix command line. For example:
>
> - the asterisk character **“*”** represents 0 or more characters in a filename, or by itself, all files in a directory.
> - the square brackets **[...]** can be used define a range of values e.g. [0-9], [A-Z], etc.
> - the question mark **“?”** can represent any single character.
>
> These characters can be used as “Wildcards” to perform operations on multiple files at the same time. Lets see some examples.

```
# Create a directory with the name wildcard_practice and, inside it, create some empty file
mkdir wildcard_practice
cd wildcard_practice
touch file1.txt file2.txt file10.txt
touch image1.png image2.png imageA.png
touch data_2022.csv data_2023.csv data_2024.csv
# List all the .txt files
ls *.txt
# create a directory called data and move the .csv files into data/
mkdir data
mv *.csv data/
```

Exercise List only the .csv files with years 2022 or 2023

8.3 Delete (remove) files and directories

WARNING!!

Using the rm command permanently deletes files and directories without moving them to a trash or recycle bin. This action cannot be undone! Whenever you use the rm command, ALWAYS double-check your syntax.

```
# Lets remove some unwanted files and directories
rm ~/Documents/projects/README.txt
# the command rmdir can remove an empty directory, so it is safer!
mkdir test_dir
rmdir test_dir
# The dangerous way. Use rm recursively "-r" to remove a non-empty directory. BE CAUTIOUS! YO
rm -r ~/Documents/projects/project1
# check the help page for rm command. Is there a safer way to do this?
```

Exercise

1. Create a directory `data`.
2. Inside `data`, create three empty files: `sample1.txt`, `sample2.txt`, `sample3.txt`
3. Copy `sample1.txt` into a new directory called `backup`.
4. Rename `sample2.txt` to `s2.txt`.
5. Remove `sample3.txt`.

8.4 Viewing and inspecting Files

Sometimes we want to quickly look at files, either to inspect their structure or to get some basic information about their contents. These are some commands we can use to do so.

Command	Description
cat	print entire file
less	scroll through file
head	show first n lines
tail	show last n lines
wc	count (**w**ord **c**ount)

```
# Lets use the file "butterfly_ecology.csv" you previously used with R.
# You can either navigate to the folder you saved the file copy it to a new directory.
# You can use the "cat" command for viewing the contents of a file
cat butterfly_ecology.csv
# Another command for viewing the contents of a file is "less". This command allows to scrol
less butterfly_ecology.csv
# However, most of the time we only need to see part of a file rather than the entire file. T
head butterfly_ecology.csv
tail butterfly_ecology.csv
# or you can specify the number of lines to print (by default will print 10)
head -n 2 butterfly_ecology.csv
tail -n 3 butterfly_ecology.csv
# The command wc (word count) is useful for counting how many lines, words, and characters th
wc butterfly_ecology.csv
# Can you find an option for wc that will let us get only the number of lines of the file?
```

> **Note**
>
> The **cat** command can also be used to create new files or to concatenate existing files. Lets try:
>
> ```
> cat > file1
> Stefanos
> # Exit by pressing Ctrl + D
> cat > file2
> some random text
> # Exit by pressing Ctrl + D
> cat file1 file2 > file3
> ```

8.5 A text editor for the terminal

A simple text editor available on most systems is nano. To run it, simply specify a file name to edit. If the file doesn't exist already, it will be created after saving.

```
nano NOTES.txt
```

Part III

Phylogenetics

Part IV

Microbiome

References