Exploration of FELLOW trait dataset

The objective of this document is to:

- visually explore the trait database
- understand trait coverage / data gaps
- check for possible inconsistencies

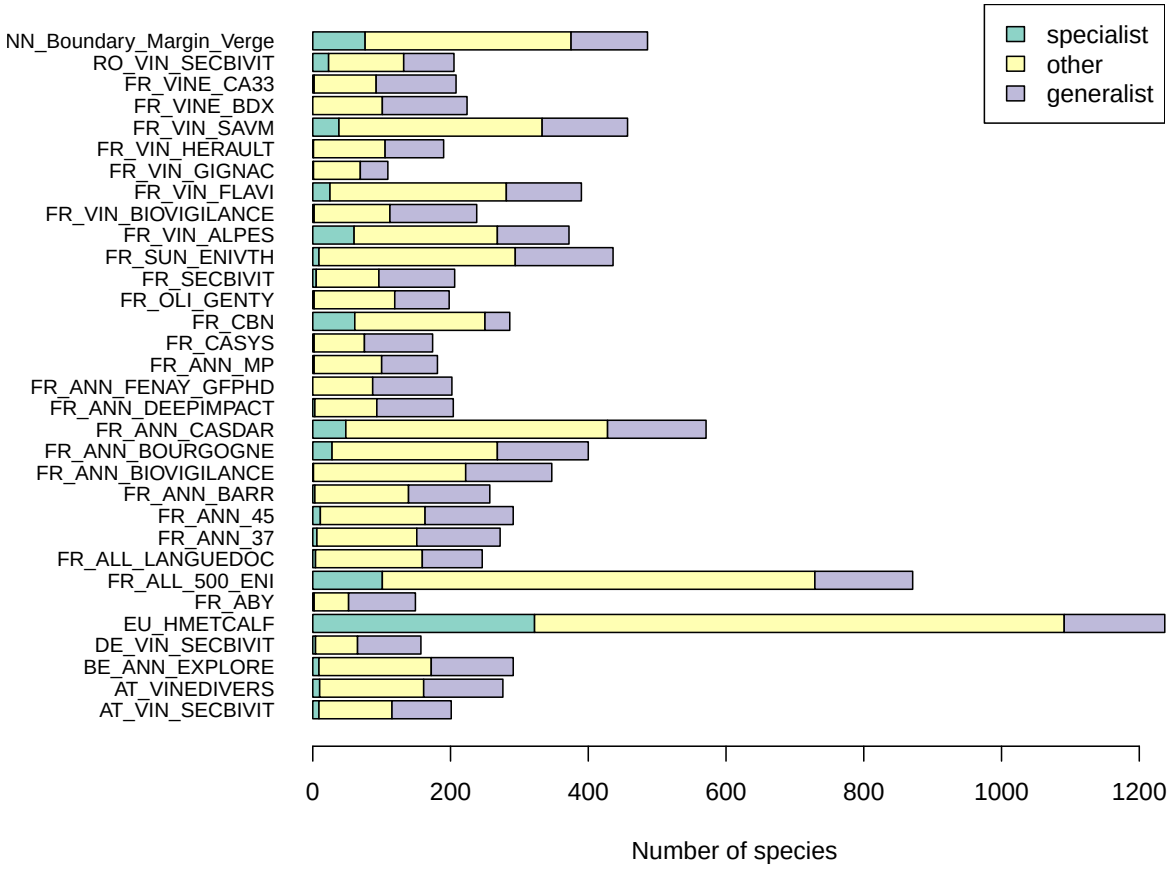
Description of the species list

We compiled the species lists from 32 datasets. After cleaning and harmonization, there were 2109 unique taxa.

FAMILY	GENUS	SPECIES	SUBSPECIES	VARIETY
15	261	1701	122	10

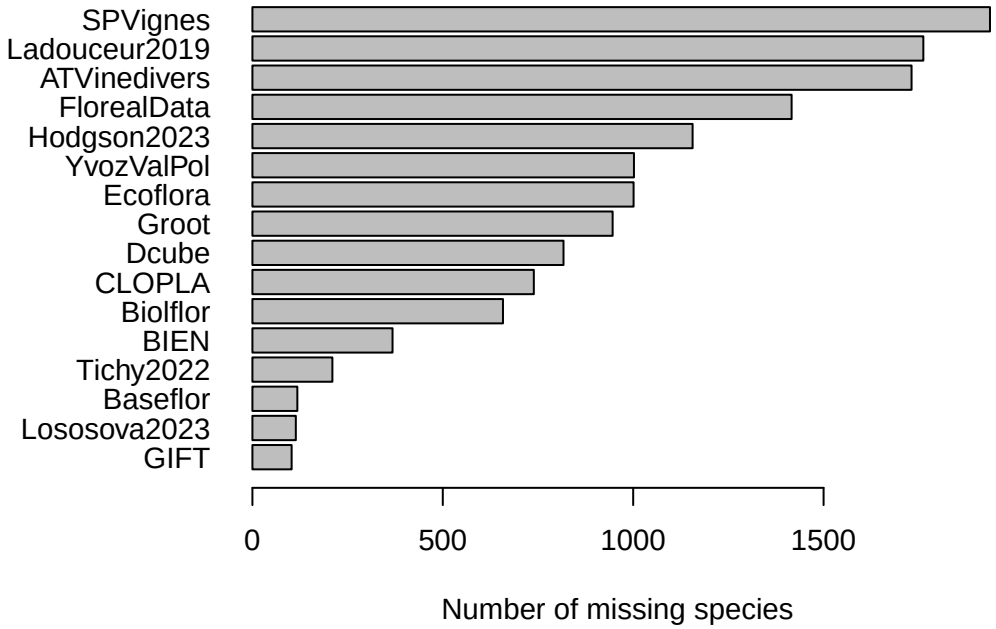
Let's define:
specialist: a taxa that occurred only in a singe database
generalist: a taxa that is listed in 50% of the databases (17 out of 32)

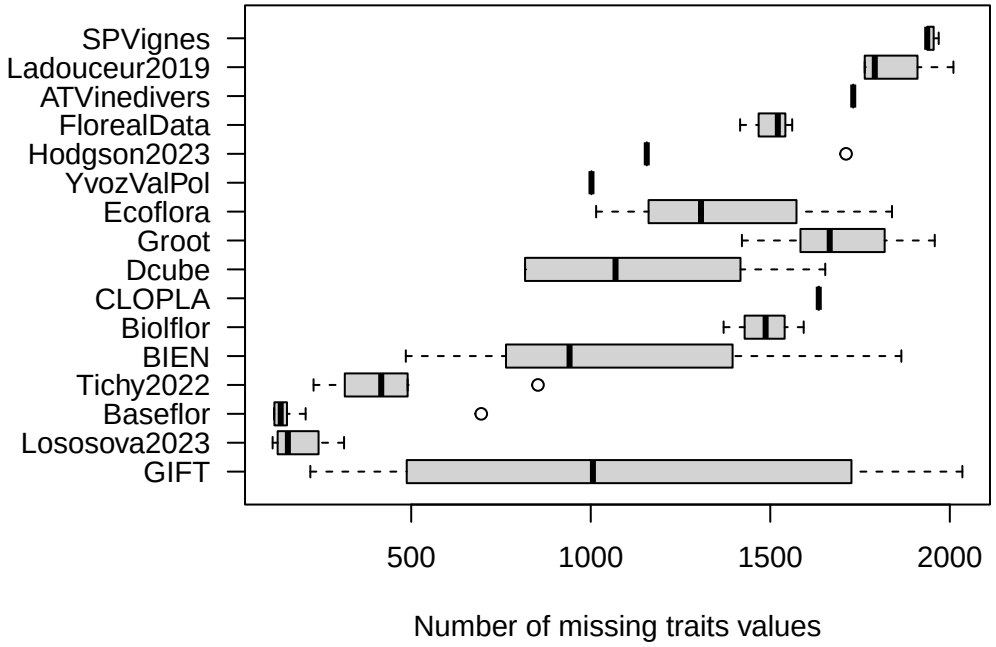
```
sp_class
specialist      other generalist
       870       1092        147
```

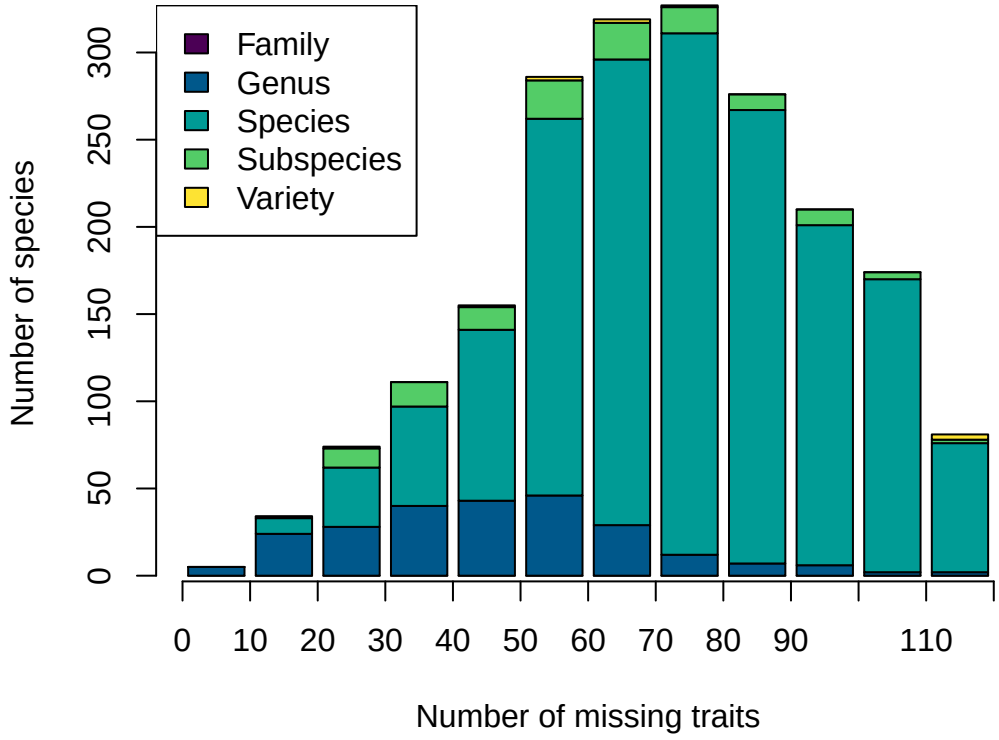


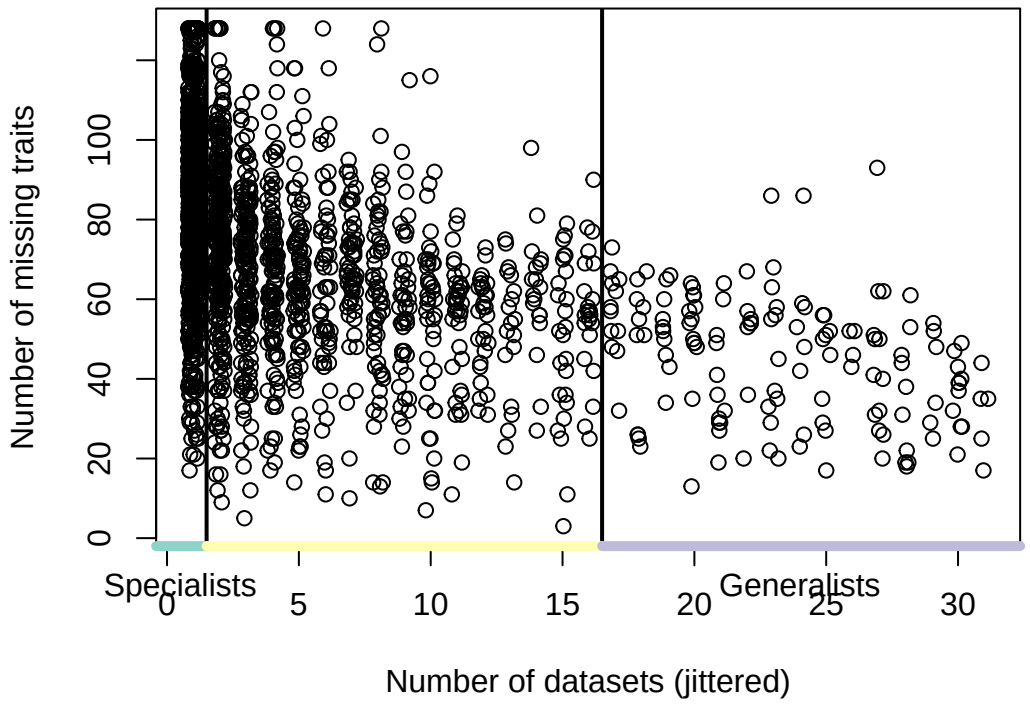
Description of trait databases

So far, we compiled 128 traits for 2109 taxa gathered from 16 trait databases. But there are many missing values.






Family
Genus
Species
Subspecies
Variety
Number of species
0
50
100
150
200
250
300
0
10
20
30
40
50
60
70
80
90
110
Number of missing traits


Number of missing traits
0
20
40
60
80
100
Specialists
Generalists
0
5
10
15
20
25
30
Number of datasets (jittered)

Taxa with no or limited trait information (N=38).

```
 [1] "Abies"                    "Acacia"
 [3] "Agropyron"                "Amaranthaceae"
 [5] "Apiaceae"                 "Asparagaceae"
 [7] "Aster"                    "Boraginaceae"
 [9] "Brassicaceae"             "Bryum dichotomum"
[11] "Caryophyllaceae"          "Chaenomeles x superba"
[13] "Chrysanthemum"            "Circaea"
[15] "Cochlearia"               "Cosmos"
[17] "Cupressus"                "Ephippiger perforatus"
[19] "Geraniaceae"              "Imbribryum subapiculatum"
[21] "Lamiaceae"                "Lavandula"
[23] "Liliaceae"                "Matthiola"
[25] "Milium"                   "Moehringia"
[27] "Orchis"                   "Paronychia"
[29] "Piptatherum"              "Poaceae"
[31] "Primulaceae"              "Pulmonaria"
[33] "Rhizogemma staphylina"    "Riccia sorocarpa"
[35] "Riccia warnstorfii"       "Roemeria hispida"
[37] "Rosaceae"                 "Rubiaceae"
```

Open question:

How to deal with families taxa?

How to deal with missing trait values? Trait imputation, discarding taxa, …

Summary of trait completness

Trait	N database	N taxa	Completness (%)
Growth.form	5	2058	98
Dispersal.mode	4	2043	97
Plant.height	9	2000	95
Chorology	1	1991	94
Habitat	1	1990	94
Fruit.type	2	1982	94
Sexuality	1	1982	94
Pollination	1	1981	94
Flower.color	5	1968	93
Dispersal.distance	1	1967	93
Inflorescence	2	1959	93
Lifecycle	2	1918	91
Ellenberg.Salinity	1	1881	89
Seed.mass	6	1875	89
Flowering	2	1804	86
Ellenberg.Light	1	1794	85
Photosynthetic.pathway	1	1776	84
Ellenberg.Reaction	1	1763	84
Ellenberg.Moisture	1	1622	77
Ellenberg.Nutrients	1	1619	77
SLA	4	1514	72
Pollination.syndrome	3	1473	70
Flower.UV.reflectance	3	1316	62
Diaspore.exposure	1	1292	61
Diaspore.type	1	1292	61
Leaf.area	2	1259	60
Ellenberg.Temperature	1	1256	60
Leaf.dry.mass.content	1	1109	53
Floral.symmetry	1	1107	52
Flower.class	1	1107	52
Flower.type	1	1107	52
Nectar.quantity	1	1107	52
Pollen.quantity	1	1107	52
PV.Bees	1	1107	52
PV.Bumblebees	1	1107	52
PV.butterflies	1	1107	52
PV.Hoverflies	1	1107	52
Anemochory	1	1103	52
Leaf.dry.mass	1	1057	50

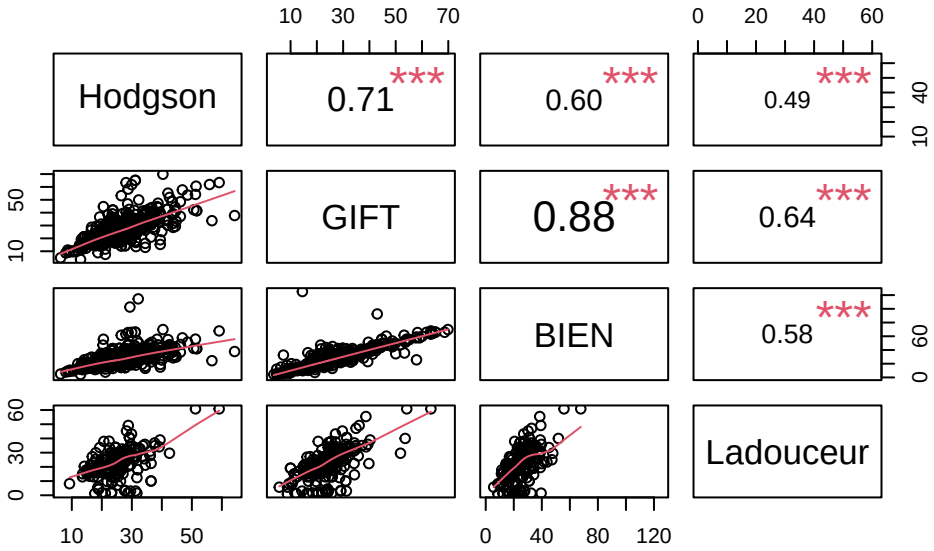
Trait	N database	N taxa	Completness (%)
Epizoochory	1	977	46
Canopy.diameter	1	953	45
Canopy.height	1	953	45
Diaspore.mass	1	898	43
Leaf.width	1	785	37
Lifeform	2	745	35
Root.mycorrhizal.colonization	1	688	33
Root.mass.fraction	1	633	30
Seed.length	1	622	29
Grassland.specialization	1	590	28
Specific.root.length	1	548	26
Flower.length	2	534	25
Root.lateral.spread	1	502	24
Root.diameter	1	495	23
Diaspore.height	1	486	23
Clonal.index	2	483	23
lateral.spread	1	476	23
offspring	1	474	22
offspring.wsmall	1	474	22
Root.tissue.density	1	469	22
Flowering.onset	2	464	22
Hydrochory	1	456	22
Root.N.concentration	1	418	20
Vegetative.propagation	1	398	19
Root.depth	2	385	18
Plant.lifespan	1	378	18
Strategy.Grime	1	378	18
Leaf.nitrogen.content	1	371	18
Flowering.duration	1	346	16
Seeding.onset	1	346	16
Seeding.season	1	346	16
Root.C.concentration	1	325	15
Clonal.presence	1	318	15
Leaf.length	1	310	15
Root.dry.matter	1	305	14
Clonal.cyclicity	1	303	14
Root.C.N.ratio	1	276	13
Leaf.carbon.to.nitrogen.content	1	244	12
Seed.dormancy	1	199	9
Clonal.spread	1	192	9
Germination.range	1	172	8

Trait	N database	N taxa	Completness (%)
Germination.start	1	172	8
Strategy	1	154	7
Root.length.density	1	151	7
Flower.width	2	148	7
Radial.growth	1	99	5
Fruit.color	1	74	4

Comparison

SLA

There are four sources of information for Specific leaf area (SLA) : Hodgson et al. 2023 (in mm2/mg), GIFT (in cm2/g), BIEN (in m2/kg = mm2/mg), and Ladouceur et al. 2023 (in cm2/g).



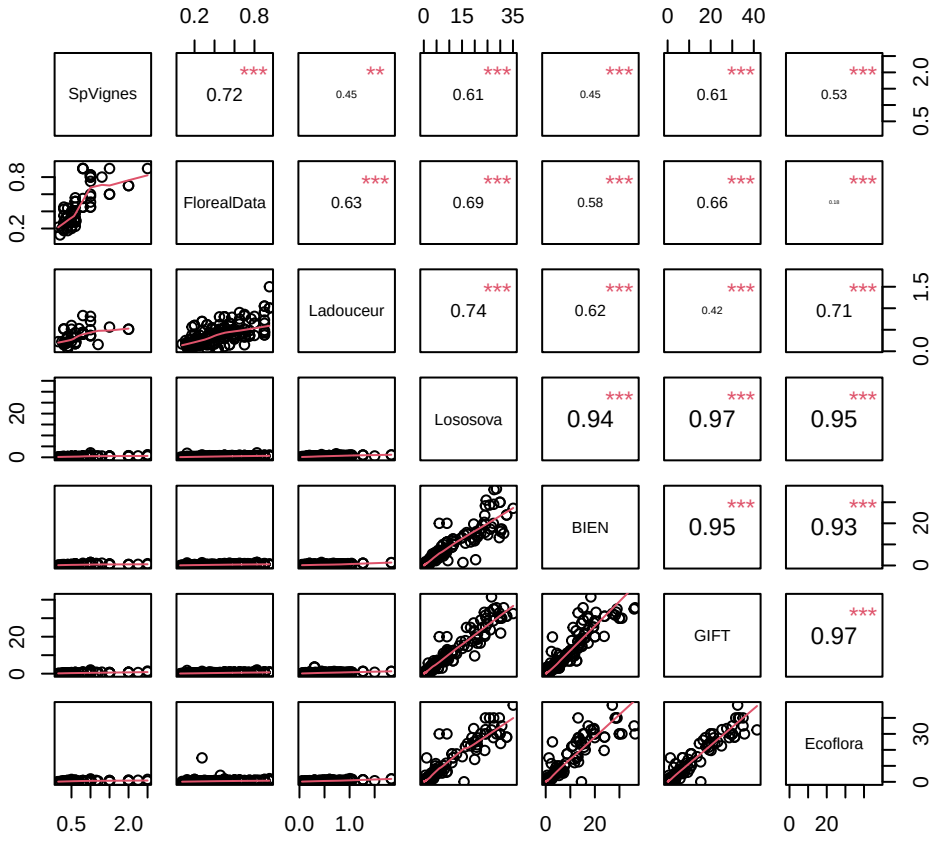
Values are highly correlated, so we could imagine filling the missing values (using preferred data sources or averaging them).

Number of NAs:

```
Hodgson      GIFT      BIEN Ladouceur    filled
   1156       888       880      1816       595
```

Plant height

There are seven sources of information for plant height.



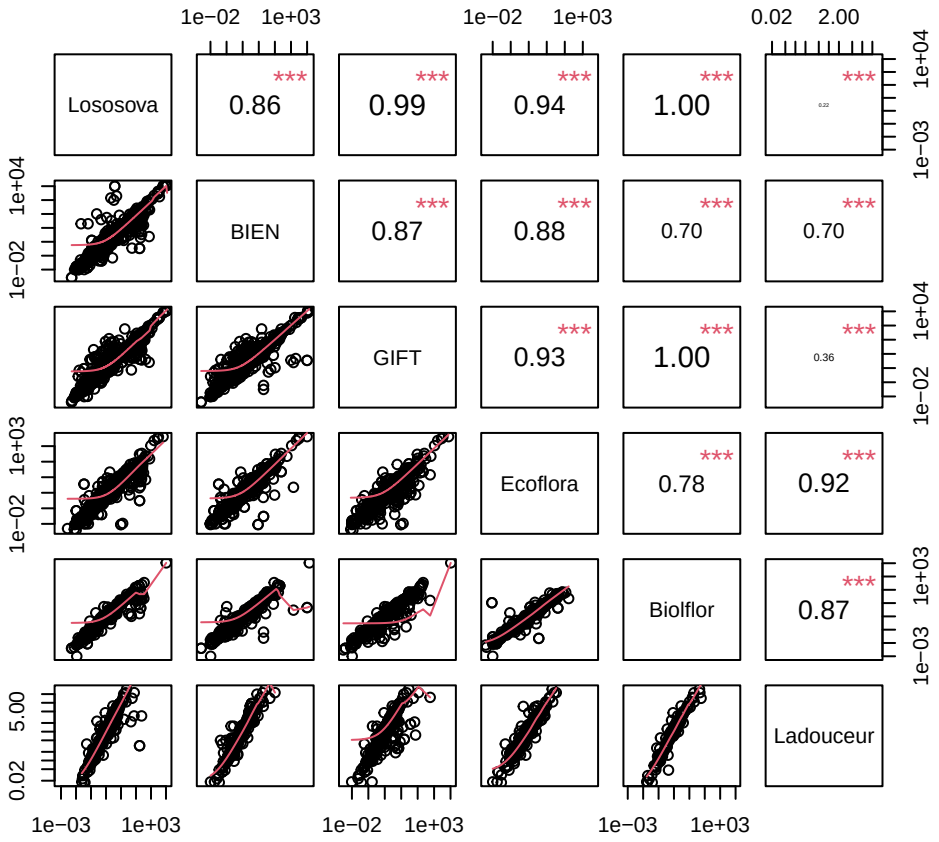
SPVignes, FlorealData, and Ladouceur_2019 are limited to small plants (<1m) (no trees) *but FlorealData>100cm must be clean.*

Number of NAs:

```
   SpVignes FlorealData   Ladouceur    Lososova        BIEN        GIFT
       1969        1644        1779         171         745         600
   Ecoflora      filled
       1015         131
```

Seed mass

There are six sources of information for seed mass



Number of NAs:

Lososova	BIEN	GIFT	Ecoflora	Biolflor	Ladouceur	filled
313	744	375	1307	1593	1779	234

Flower colour

There are five sources of information for flower colour, but it must be cleaned

```
   Baseflor        BIEN        GIFT FlorealData  YvozValPol
        206        1832        1810        1523        1002
```

```
baseflor
             Blanc       Blanc, jaune Blanc, jaune, bleu Blanc, jaune, rose
               364                 33                  3                   4
       Blanc, rose  Blanc, vert, rose               Bleu        Bleu, blanc
                54                  1                154                  11
 Bleu, blanc, rose        Bleu, jaune  Bleu, jaune, rose         Bleu, rose
                11                  5                  2                  10
             Jaune        Jaune, rose        Jaune, vert             Marron
               488                  3                  1                  28
              Noir               Rose               Vert         Vert, bleu
                 2                314                264                  14
 Vert, jaune, rose         Vert, rose
                 1                 36
```