



IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy

From the field to the desk

[Session 3]

Miguel Alvarez

5th May 2023



This Session

IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy

- ▶ Data Shapes
- ▶ Introduction to vegetable
- ▶ Assessing taxonomic information in plots



Data Shapes

IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy



Vegetation-plot observation

Phytosociological relevés

- ▶ Abundance/presence of species in plot
- ▶ Environmental variables
- ▶ Species attributes
 - ▶ Life forms
 - ▶ Chorology
 - ▶ Functional traits
 - ▶ Taxonomy



Data Shapes

IAVS-LAC

... served to the readers

... served to the statistical software

This Session

Data Shapes

Package
vegetable

Taxonomy

Table 2. *Tessario absinthioidis*-*Baccharidetum marginalis* Oberd. 1960

Riverbank composition: R/r = rocks (> 50 cm Ø); G/g = gravel (< 50 cm Ø);
indicate abundant, lowercase scarce; (x) = xenophytic plant

Altitude (m asl)	160	225	1110	1055	505
Area (m ²)	80	180	100	250	200
Slope (°)	0	0	0	10	0
Cover E _i (%)	100	85	100	60	70
High shrub layer (m)	5-8	3-8	1-3	1-2	1-2.5
Riverbank composition	gsL	gS	rGS	RGS	rGS
Latitude	34° 03'	34° 22'	35° 02'	35° 02'	35° 42'
N. species	11	10	14	9	13
N. relevé	1	2	3	4	5
<i>Baccharidetum / Salicetea</i> species					
<i>Baccharis salicifolia</i>	1	3	3	3	4
<i>Otholobium glandulosum</i>	2	1	.	.	3
<i>Cortaderia gr. selloana</i>	.	r	1	+	1
<i>Salix humboldtiana</i>	4	4	.	.	.
<i>Tessaria absinthioides</i>	.	3	4	3	+
<i>Equisetum bogotense</i>	.	.	2	.	1
<i>Discaria trinervis</i>	.	.	3	.	.
<i>Buddleja globosa</i>	.	.	+	.	.
<i>Escallonia myrtoidea</i>	.	.	+	.	.
<i>Myrceugenia lanceolata</i>	.	.	.	.	.

##	Adesparv	Bromtris	Cardramo
## 6216	1	1	1
## 6217	0	1	0
## 6218	0	0	0
## 6219	0	0	0
## 6220	0	0	0
## 6221	0	0	0
## 6222	0	0	0
## 6359	0	0	0
## 6360	0	1	1
## 6361	0	1	0
## 6362	0	1	0
## 6523	0	1	0
## 6524	0	1	0
## 6574	0	0	0
## 6575	0	0	0
## 6576	0	1	1
## 6577	0	0	0
## 6578	0	0	0
## 6579	0	0	0
## 6580	0	0	0

Crasdecu Dichseri

6216 1 1

6217 0 0



Data Shapes

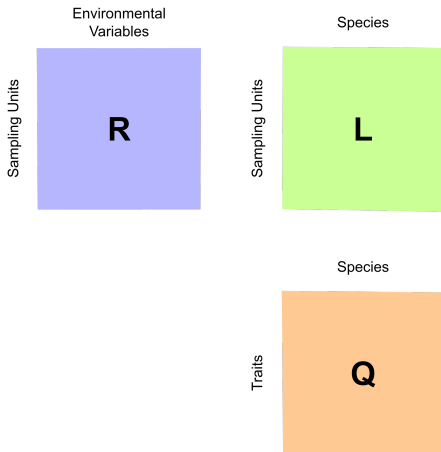
IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy



- ▶ **R** environmental table (header)
- ▶ **Q** species-trait table (vegetation matrix)
- ▶ **L** species composition table (species attributes)

Dolédec et al. (1996) Environmental and Ecological Statistics



Data Shapes

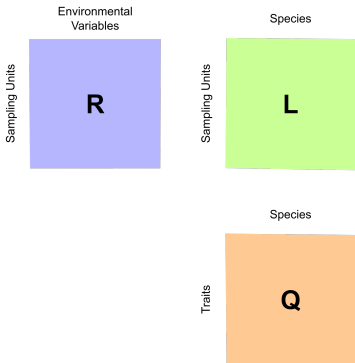
IAVS-LAC

This Session

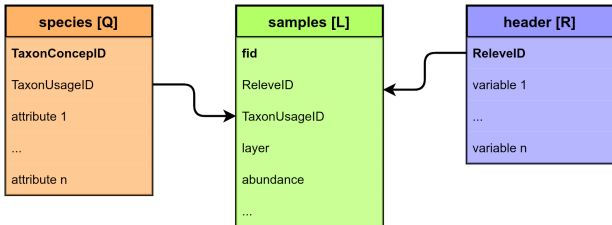
Data Shapes

Package
vegetable

Taxonomy



Relational database schema



- ▶ Efficient storage
 - ▶ Efficient data assessment?
- ▶ Little redundancy
- ▶ Consistency



Data Shapes

IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy

Vegetation matrix cross table

##	Adesparv	Bromtris	Cardramo
## 6216	1	1	1
## 6217	0	1	0
## 6218	0	0	0
## 6219	0	0	0
## 6220	0	0	0
## 6221	0	0	0
## 6222	0	0	0
## 6359	0	0	0
## 6360	0	1	1
## 6361	0	1	0
## 6362	0	1	0
## 6523	0	1	0
## 6524	0	1	0
## 6574	0	0	0
## 6575	0	0	0
## 6576	0	1	1
## 6577	0	0	0
## 6578	0	0	0
##	Crasdecu	Dichseri	
## 6216	1	1	
## 6217	0	0	

Database list column-oriented table

##	record_id	ReleveID	codename	cover
## 9329	137451	7993	Hypoglab	1
## 9330	137452	7993	Lythhyss	1
## 9331	137453	7993	Micrnana	1
## 9332	137454	7993	Piluamer	1
## 9333	137455	7993	Psilbrev	1
## 9335	137457	7993	Isolcern	2
## 9337	137459	7993	Plagsess	1
## 9338	137460	7994	Lythhyss	1
## 9339	137461	7994	Piluamer	1
## 9340	137462	7994	Psilbrev	1
## 9343	137465	7994	Plagsess	1
## 9344	137466	7994	Isoëhier	1
## 9345	137467	7258	Agrocapi	1
## 9346	137468	7258	Bromtris	1
## 9347	137469	7258	Erodmala	1
## 9348	137470	7258	Hypoglab	1
## 9349	137471	7258	Juncbufo	1
## 9350	137472	7258	Lepuspat	1

Carlos A. Ordóñez-Parra, stand of *Espeletia grandiflora*, Cundinamarca, Colombia





Package vegetable

IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy

Introduction

`taxlist` is a package designed to handle and assess taxonomic lists in R, providing an object class and functions in `S4` language. The homonymous object class `taxlist` was originally designed as a module for taxa recorded in vegetation-plot observations (see [vegetable](#)), but became as an independent object with the ability of contain not only lists of species but also synonymy, hierarchical taxonomy, and functional traits (attributes of taxa).

The main aim of this package is to keep consistence in taxonomic lists (a set of rules are checked by the function `validObject()`), to enable the re-arrangement of such data, and to statistically assess functional traits and other attributes, for instance taxonomy itself (function [tax2traits\(\)](#) set taxonomic information as trait).

While this package only includes a function for the import of taxonomic lists from [Turboveg](#), almost any data source can be structured as `taxlist` object, so far the information is imported into data frames in an R session and the consistency rules are respected (validity).

The use of `taxlist` is recommended for people cleaning raw data before importing it to relational databases, either in the context of taxonomic work or biodiversity assessments. The other way around, people having relational databases or clean and structured taxonomic lists may

- Developed at **GitHub**
- Released in CRAN
- Structure data using **S4** (oop in R)



Package vegetable

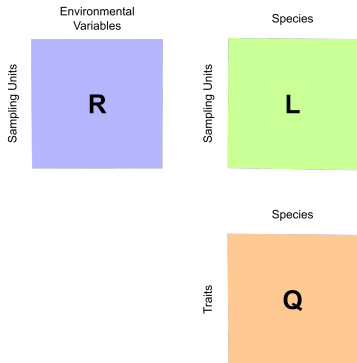
IAVS-LAC

This Session

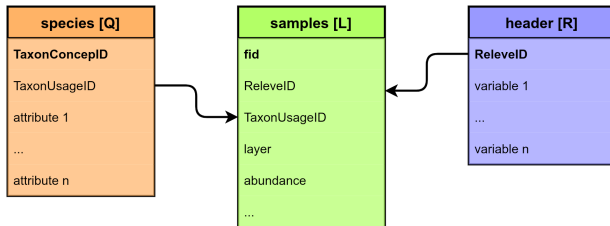
Data Shapes

Package
vegetable

Taxonomy



Relational database schema



Dolédec et al. (1996) *Environmental and Ecological Statistics*



Package vegetable

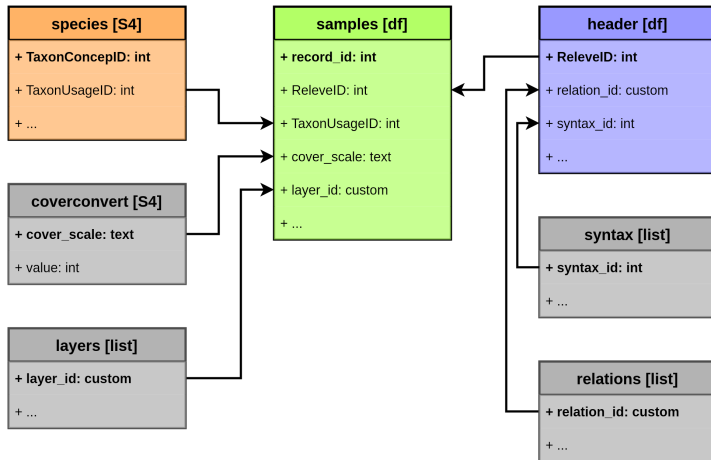
IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy





Package vegetable

IAVS-LAC

This Session

Data Shapes

Package
vegetable

Taxonomy

vetable complex

- ▶ taxlist
- ▶ vegetable
- ▶ biblio

```
# Vegetation-plots
```

```
class(releves)
```

```
## [1] "vegetable"
```

```
## attr(,"package")
```

```
## [1] "vegetable"
```

```
# Taxonomic list
```

```
class(releves@species)
```

```
## [1] "taxlist"
```

```
## attr(,"package")
```

```
## [1] "taxlist"
```

```
# Bibliographic references
```

```
class(releves@relations$data_source)
```

```
## [1] "lib_df"      "data.frame"
```

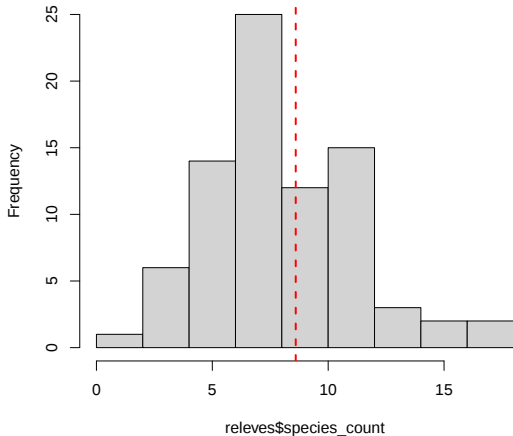




Counting Taxa

```
releves <- count_taxa(  
  object = species ~ RelevéID,  
  data = releves,  
  suffix = "_count",  
  include_lower = TRUE,  
  in_header = TRUE)  
  
hist(releves$species_count)  
abline(v = mean(releves$species_count),  
       col = "red", lty = "dashed", lwd = 2)
```

Histogram of releves\$species_count





Diversity Indices

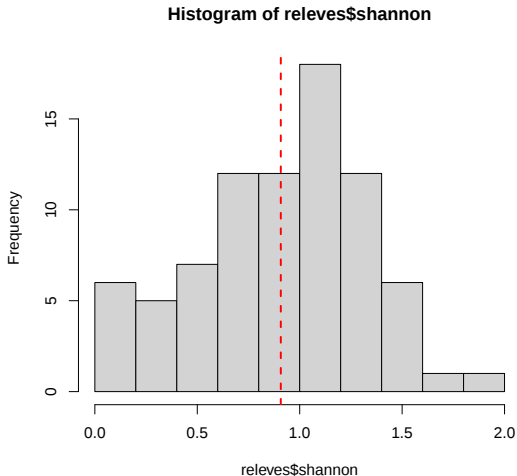
This Session

Data Shapes

Package
vegtable

Taxonomy

```
releves <- veg_diversity(  
  object = releves,  
  weight = "cover_percentage",  
  FUN = shannon,  
  in_header = TRUE)  
  
hist(releves$shannon)  
abline(v = mean(releves$shannon),  
       col = "red", lty = "dashed", lwd = 2)
```

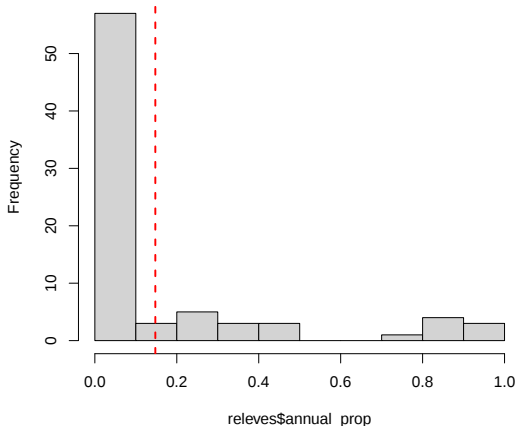




Categorical Attributes

```
releves <- trait_proportion(  
  object = releves,  
  trait = "life_form",  
  head_var = "ReleveID",  
  include_nas = FALSE,  
  weight = "cover_percentage",  
  suffix = "_prop",  
  in_header = TRUE)  
  
hist(releves$annual_prop)  
abline(v = mean(releves$annual_prop,  
  na.rm = TRUE),  
  col = "red", lty = "dashed", lwd = 2)
```

Histogram of releves\$annual_prop





Calculations

```
releves <- trait_proportion(  
  object = releves,  
  trait = "life_form",  
  head_var = "ReleveID",  
  include_nas = FALSE,  
  weight = "cover_percentage",  
  suffix = "_prop",  
  in_header = TRUE)
```

Finding candidates for...

```
# trait  
names(releves@species@taxonTraits)  
  
# head_var  
names(releves@header)  
  
# weight  
names(releves@samples)
```



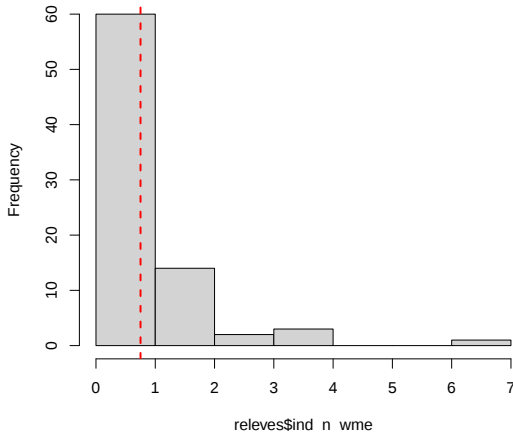
Attribute Statistics

```
wme <- function(x, w, na.rm = TRUE)
  mean(x*w, na.rm = na.rm)/
  sum(w, na.rm = na.rm)

releves <- trait_stats(
  object = releves,
  FUN = wme, trait = "ind_n",
  head_var = "ReleveID",
  weight = "cover_percentage",
  suffix = "_wme",
  in_header = TRUE)

hist(releves$ind_n_wme)
abline(v = mean(releves$ind_n_wme,
  na.rm = TRUE),
  col = "red", lty = "dashed", lwd = 2)
```

Histogram of releves\$ind_n_wme



Thank You!



Bianca Ott Andrade, grasslands, Treinta y Tres, Uruguay