Basics on the work with vegetation-plots in vegtable

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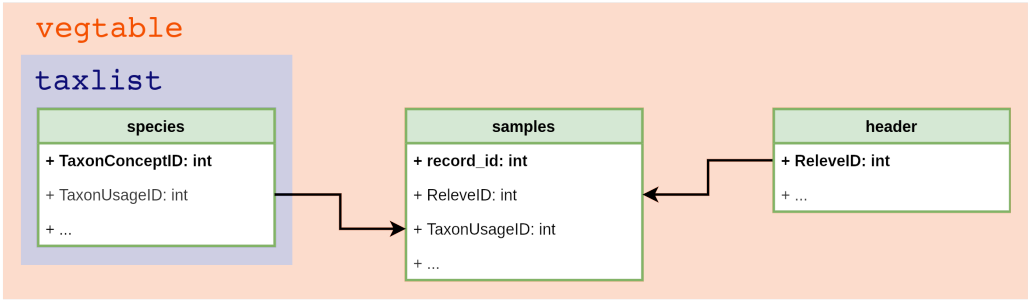
Introduction

vegtable-taxlist complex



species: Taxonomic list with taxon attributes (taxonomic ranks, functional traits, chorology, . . .)

header: Attributes associated to plots (size, location, ecological attributes, . . .)

samples: Records of taxa in plots (frequency, abundance, . . .)

Introduction

Why R?

- Increasing popularity among scientists
- Collaborative data assessment
  - R-script + R-image
  - R-markdown (+ R-script) + R-image (+ Data)
  - Project Folder (ZIP file) or a repository (GitHub, GitLab, RStudio Cloud, etc.)
- Documenting and ensuring repeatability.
- Teaching purposes.

Some important information can be extracted with following commands:

```
# How many plots are in the data set?
nrow(Kenya_veg@header)
```

```
## [1] 1946
```

```
# Hoy many plots per data source?
aggregate( releveID ~ REFERENCE, data=Kenya_veg@header,
          FUN=function(x) length(unique(x)))
```

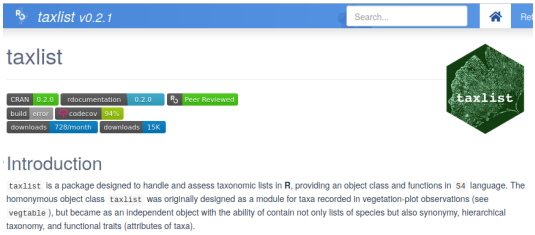
```
##   REFERENCE releveID
## 1      2974      262
## 2      3011      693
## 3      3012      610
## 4      2331      325
## 5      3506       56
```

Introduction

https://docs.ropensci.org/taxlist/

https://github.com/kamapu/vegtable

- Both packages developed on **GitHub**
- Both packages accessible at **CRAN**



Alternative installing commands:

```
## Installing from CRAN
install.packages("vegtable", dependencies=TRUE)

## Installing from GitHub
library(devtools)
install_github("ropensci/taxlist",
       build_vignettes=TRUE)
install_github("kamapu/vegtable")
```

Introduction

vegtable in retrospective

- **2015:** Experiments on the basis of `vegdata`
- **2017:** First version at ***CRAN***
- **2018:** Publication of `taxlist` by Alvarez & Luebert in ***Biodiversity Data Journal***
- **2020:** `taxlist` accepted in ***rOpenSci***

Biodiversity Data Journal 6: e23635
doi: 10.3897/BDJ.6.e23635

open access

R Package

The taxlist package: managing plant taxonomic lists in R

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ZooBank: urn:lsid:zoobank.org:pub:E16342C5-6C4D-4690-8042-7329E43D2292

Abstract

Taxonomic lists are crucial elements of vegetation-plot databases and provide the links between original entries, reference taxon views and different taxon concepts. We introduce the R package *taxlist* in the context of object-oriented modelling for taxonomic lists. This package provides a data structure based on species lists in Turboveg, which is a software broadly used for the storage of vegetation-plot databases and implements functions for importing and handling them prior to statistical analysis. We also present a schema for relational databases, compatible with *taxlist* objects and recommend its use for handling diversity records.

Keywords

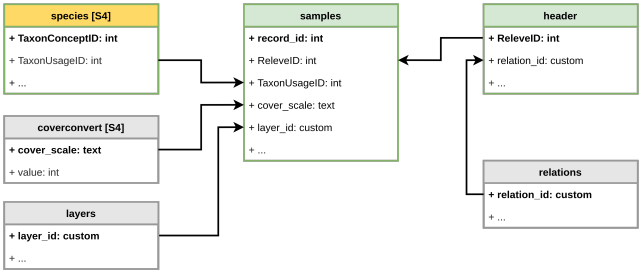
ecoinformatics, database, taxon concept, taxon view, Turboveg, vegtable

Dissecting vegtable

S4 objects (definition, prototype, validation, methods) organized in slots.
Resembling **Turboveg**'s dbf-files and relational databases.

description (metadata)
species (a `taxlist` object)
header (plot information)
relations (tables with relationships to *header*)
samples (record table)
layers (tables with relationships to *samples*)
coverconvert (coverage/abundance conversions)

Slots in vegtable objects



Dissecting vegtable

Slot species (`obj@species`)

Taxonomic information of *recorded organisms* stored in a `taxlist` object.

- Relationships of usage names and taxon concepts
- Parent-child relationships and taxonomic ranks
- Functional traits
- Connected through **TaxonUsageID**

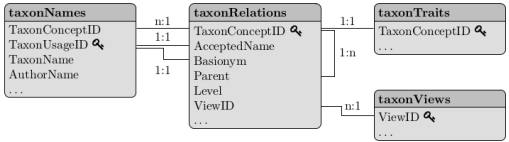
`taxlist` supports different degrees of information completeness/resolution

```
Kenya_veg@species
```

```
## object size: 554 Kb
## validation of 'taxlist' object: TRUE
##
## number of taxon usage names: 3164
## number of taxon concepts: 2392
## trait entries: 102
## number of trait variables: 1
## taxon views: 3
##
## concepts with parents: 2237
## concepts with children: 957
##
## hierarchical levels: form < variety < subspecies < speci
## number of concepts in level form: 0
## number of concepts in level variety: 65
## number of concepts in level subspecies: 52
## number of concepts in level species: 1422
## number of concepts in level complex: 0
## number of concepts in level genus: 699
## number of concepts in level family: 154
```

Dissecting vegtable

Slot species (`obj@species`)



Alvarez & Luebert (2018)

```
summary(Kenya_veg@species, "Cyperus involucratus",
        secundum="secundum")
```

```
## ------------------------------
## concept ID: 51757
## view ID: 1 - African Plant Database (2012)
## level: species
## parent: 54853 Cyperus L.
##
## # accepted name:
## 51757 Cyperus involucratus Rottb.
##
## # synonyms (1):
## 53973 Cyperus flabelliformis Rottb.
## ------------------------------
```

```
summary(Kenya_veg@species, 54853, secundum="secundum")
```

```
## ------------------------------
## concept ID: 54853
## view ID: 2 - Taxonomic Name Resolution Service (2018)
## level: genus
## parent: 55959 Cyperaceae NA
##
## # accepted name:
## 54855 Cyperus L.
## ------------------------------
```

Dissecting vegtable

Slot header (`obj@header`)
Main table (data frame) including information on plot observations (relevés).

- Identifiers
- Time and location of records
- Environmental information (e.g. soil sample analyses)
- Remarks
- *Statistics*

Variable **ReleveID** is mandatory in header.

```
head(Kenya_veg@header)
```

```
##     ReleveID COUNTRY REFERENCE TABLE_NR NR_IN_TAB
## 358      358      KE      2974        1         1
## 359      359      KE      2974        1         2
## 360      360      KE      2974        1         3
## 361      361      KE      2974        1         4
## 362      362      KE      2974        1         5
## 363      363      KE      2974        1         6
##     COVERSCALE DATE SURF_AREA ALTITUDE EXPOSITION
## 358         01 <NA>        NA       NA       <NA>
## 359         01 <NA>        NA       NA       <NA>
## 360         01 <NA>        NA       NA       <NA>
## 361         01 <NA>        NA       NA       <NA>
## 362         01 <NA>        NA       NA       <NA>
## 363         01 <NA>        NA       NA       <NA>
##     INCLINATIO COV_TOTAL TREE_HIGH     REMARKS
## 358         NA        NA        NA Mount Nyiro
## 359         NA        NA        NA Mount Nyiro
## 360         NA        NA        NA Mount Nyiro
## 361         NA        NA        NA Mount Nyiro
## 362         NA        NA        NA Mount Nyiro
## 363         NA        NA        NA Mount Nyiro
##     LONGITUDE LATITUDE PH_H2O
## 358   36.8167   2.1833     NA
## 359   36.8167   2.1833     NA
```

Dissecting vegtable

Slot header (`obj@samples`)

Data frame incluging the records of taxa (inserted as taxon usage names) in plot observations (relevés).

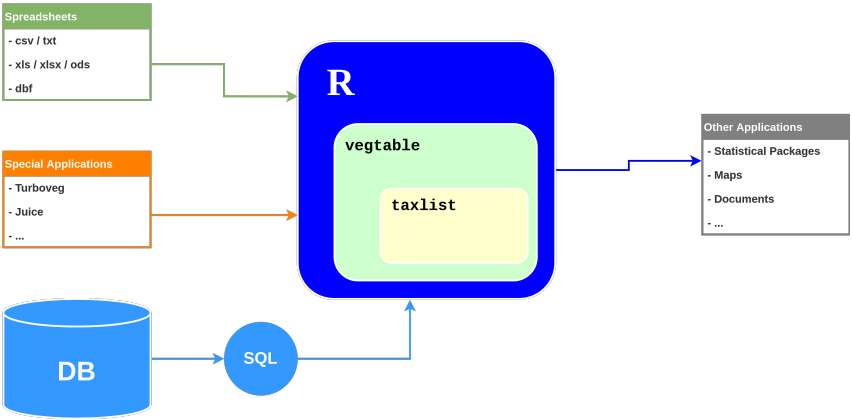
- Occurrence, frequency, abundance, sociability, etc.
- Relationships to layers.
- Relationships to collected specimens.
- Relationships to individuals.

Variables ** releveID** and **TaxonUsageID** are mandatory.

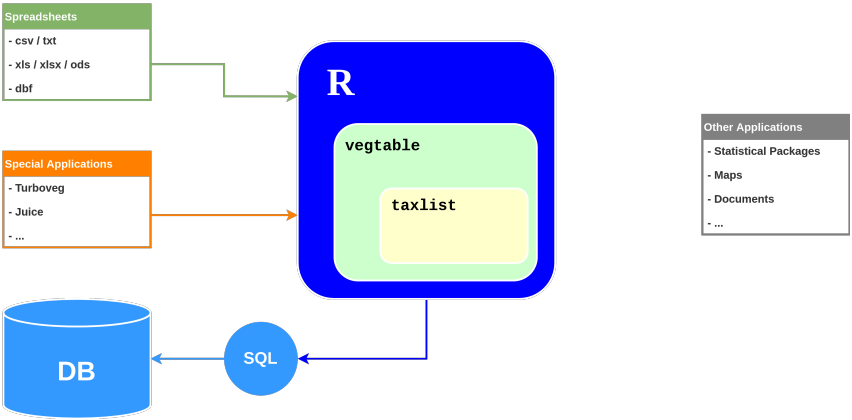
```
head(Kenya_veg@samples)
```

```
##       releveID TaxonUsageID COVER_CODE LAYER
## 5658      358           18          +     0
## 5659      358          220          r     0
## 5660      358          233          +     0
## 5661      358          287          +     0
## 5662      358          407          r     0
## 5663      358        54983          r     0
##      SOCIABILIT INDIVID br_bl b_bbds
## 5658       <NA>    <NA>     +   <NA>
## 5659       <NA>    <NA>     r   <NA>
## 5660       <NA>    <NA>     +   <NA>
## 5661       <NA>    <NA>     +   <NA>
## 5662       <NA>    <NA>     r   <NA>
## 5663       <NA>    <NA>     r   <NA>
```

Recipe


Spreadsheets
- csv / txt
- xls / xlsx / ods
- dbf
Special Applications
- Turboveg
- Juice
- ...
DB
SQL
R
vegtable
taxlist
Other Applications
- Statistical Packages
- Maps
- Documents
- ...

Recipe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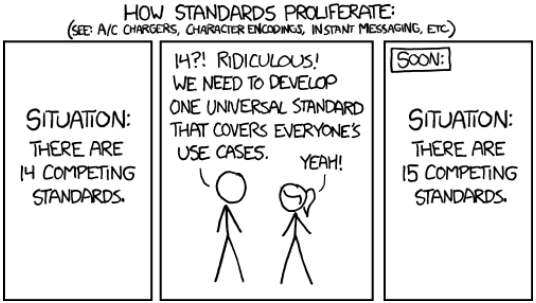
DB
SQL

For the Future

- Multiple taxon views implemented in `taxlist`
- Import/export functions for **Veg-X**
- Better interaction with **Juice** (ideally in Linux)
- Better interaction with **Turboveg**
- Implementation in **sPlot**
- Contributions to **GIVD**
- Calculation of diversity indices (Shannon's H, Constancy values, Mean cover, etc.)
- Summaries for communities



xkcd.com

THANKS!

For discussion:

https://stackoverflow.com/users/5846398/miguel-alvarez

https://www.researchgate.net/profile/Miguel_Alvarez18

https://www.facebook.com/groups/ecologyinr

https://github.com/kamapu/vegtable/issues

...and also visit me at https://kamapu.github.io/