

Package ‘taxa’

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Type Package

Title Classes for Storing and Manipulating Taxonomic Data

Description Provides classes for storing and manipulating taxonomic data. Most of the classes can be treated like base R vectors (e.g. can be used in tables as columns and can be named). Vectorized classes can store taxon names and authorities, taxon IDs from databases, taxon ranks, and other types of information. More complex classes are provided to store taxonomic trees and user-defined data associated with them.

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vctrs

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URL <https://docs.ropensci.org/taxa/>, <https://github.com/ropensci/taxa>

BugReports <https://github.com/ropensci/taxa/issues>

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as_data_frame	3
as_taxon	4
classification	4
db_ref	6
internodes	7
is_classification	8
is_internode	8
is_leaf	9
is_root	9
is_stem	10
is_taxon	11
is_taxonomy	11
is_taxon_authority	12
is_taxon_db	12
is_taxon_id	13
is_taxon_rank	13
leaves	14
n_leaves	14
n_subtaxa	15
n_supertaxa	16
roots	17
stems	17
subtaxa	18
supertaxa	19
taxa_taxon-class	20
taxa_taxonomy-class	20
taxa_taxon_authority-class	21
taxa_taxon_db-class	21
taxa_taxon_id-class	21
taxa_taxon_rank-class	21
taxon	22
taxon_authority	23
taxon_db	25
taxon_id	26
taxon_rank	27
tax_auth.taxa_classification	29
tax_author.taxa_classification	30
tax_cite.taxa_classification	31

tax_date.taxa_classification	32
tax_db.taxa_classification	33
tax_id.taxa_classification	34
tax_name.taxa_classification	35
tax_rank.taxa_classification	36
%in%	37

Index 38

as_data_frame	<i>Convert a taxa object to a data.frame</i>
---------------	--

Description

Convert the information in a taxa object to a data.frame using base R vectors as columns. Use [as_tibble](#) to convert to tibbles.

Usage

```
as_data_frame(
  x,
  row.names = NULL,
  optional = FALSE,
  ...,
  stringsAsFactors = default.stringsAsFactors()
)
```

Arguments

x	An object defined by taxa, such as taxon or taxon_id
row.names	NULL or a character vector giving the row names for the data frame. Missing values are not allowed.
optional	logical. If TRUE, setting row names and converting column names (to syntactic names: see make.names) is optional. Note that all of R's base package <code>as.data.frame()</code> methods use <code>optional</code> only for column names treatment, basically with the meaning of <code>data.frame(*, check.names = !optional)</code> . See also the <code>make.names</code> argument of the <code>matrix</code> method.
...	additional arguments to be passed to or from methods.
stringsAsFactors	logical: should the character vector be converted to a factor?

Examples

```
x <- taxon(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
  rank = c('species', 'genus', 'phylum', 'family'),
  id = taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
  auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))
as_data_frame(x)
```

as_taxon	<i>Convert to a taxon vector</i>
----------	--

Description

Convert other objects to [taxon](#) vectors. Compatible base R vectors can also be converted using the [taxon constructor](#).

Usage

```
as_taxon(x, ...)
```

Arguments

x	An object to be converted to a taxon vector
...	Additional parameters.

Examples

```
# Convert a taxonomy object to a taxon vector
x <- taxonomy(taxon(name = c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                             'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
                 rank = c('order', 'family', 'genus', 'species',
                           'species', 'family', 'genus', 'species'),
                 id = taxon_id(c('33554', '9681', '9688', '9689',
                                '9694', '9632', '9639', '9644'),
                              db = 'ncbi'),
                 auth = c('Bowdich, 1821', 'Fischer de Waldheim, 1817', 'Oken, 1816', 'L., 1758',
                          'L., 1758', 'Fischer de Waldheim, 1817', 'L., 1758', 'L., 1758')),
                 supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
names(x) <- letters[1:8]
as_taxon(x)

# Convert base R vectors
as_taxon(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo'))
as_taxon(factor(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo')))
```

classification	<i>Taxon class</i>
----------------	--------------------

Description

Experimental Used to store classifications in reference to a taxonomic tree.

Usage

```
classification(x = NULL, taxonomy = NULL, .names = NULL)
```

Arguments

x	One of: <ul style="list-style-type: none"> • A list where each item represents a series of nested taxa. The contents of the list can be in any form that can be converted to a taxon vector. • The indexes/names of each instance of a taxon in a taxonomy object specified by the <code>taxonomy</code> option. Can be any length, but must consist of valid indexes for taxa in the taxonomy object.
taxonomy	A taxonomy object. Only needed if taxon indexes are supplied as the first argument.
.names	The names of the vector.

Value

An S3 object of class `taxa_classification`

See Also

Other classes: [[.taxa_classification\(\)](#), [taxon_authority\(\)](#), [taxon_db\(\)](#), [taxon_id\(\)](#), [taxon_rank\(\)](#), [taxon\(\)](#)]

Examples

```
# Create classification vector with a list
x <- classification(list(
  c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo'),
  c('Carnivora', 'Felidae', 'Panthera', 'Panthera tigris'),
  c('Carnivora', 'Ursidae', 'Ursus', 'Ursus arctos'),
  c('Carnivora', 'Ursidae', 'Ursus', 'Ursus arctos'),
  c('Carnivora', 'Felidae', 'Panthera', 'Panthera tigris')
))

# Create classification vector with indexes and a taxonomy
x <- classification(c(3, 4, 4, 5, 5, 6, 8, 8, 2, 5, 6, 2),
  taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
    'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
  supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7)))

x <- classification(c(3, 4, 4, 5, 5, 6, 8, 8, 2, 5, 6, 2),
  taxonomy(taxon(name = c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
    'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
    rank = c('order', 'family', 'genus', 'species',
      'species', 'family', 'genus', 'species'),
    id = taxon_id(c('33554', '9681', '9688', '9689',
      '9694', '9632', '9639', '9644'),
      db = 'ncbi'),
    auth = c('Bowdich, 1821', 'Fischer, 1817',
      'Oken, 1816', 'L., 1758',
      'L., 1758', 'Fischer, 1817',
      'L., 1758', 'L., 1758'))),
```

```

supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
names(x) <- letters[1:12]

# Get parts of the classification vector
tax_name(x)
tax_rank(x)
tax_id(x)
tax_db(x)
tax_auth(x)
tax_author(x)
tax_date(x)
tax_cite(x)

# Manipulate classification vectors
x[1:3]
x[tax_rank(x) > 'family']
# c(x, x)
# x['b'] <- NA
is.na(x)
# as.data.frame(x)
# tibble::as_tibble(x)

# Use as columns in tables
tibble::tibble(x = x, y = 1:12)
data.frame(x = x, y = 1:12)

```

db_ref

Valid taxonomy databases

Description

This defines the valid taxonomic databases that can be used in `taxon_db` objects and objects that use `taxon_db` objects, such as `taxon_id` and `taxon`. `db_ref$get` can be used to see information for the databases. Users can add their own custom databases to the list using `db_ref$set`. For each database the following information is included:

- The URL for the website associated with the database
- A short description
- The regular expression that defines valid taxon IDs
- The ranks used in the database if specified

Usage

```
db_ref
```

Format

An object of class `list` of length 3.

Attribution

This code is based on the code handling options in [knitr](#).

Examples

```
# List all database definitions
db_ref$get()

# Get a specific database definition
db_ref$get('ncbi')

# Add or overwrite a database definition
db_ref$set(
  name = "my_new_database",
  url = "http://www.my_tax_database.com",
  desc = "I just made this up",
  id_regex = ".*"
)

# Reset definitions to default values
db_ref$reset()
```

internodes

Get internodes

Description

Get internodes indexes for each taxon or another per-taxon value. An internode is a taxon with exactly one supertaxon and one subtaxon. These taxa can be removed without losing information on the relationships of the remaining taxa.

Usage

```
internodes(x)
```

Arguments

x The object to get internodes for, such as a [taxonomy](#) object.

See Also

Other taxonomy functions: [leaves\(\)](#), [roots\(\)](#), [stems\(\)](#), [subtaxa\(\)](#), [supertaxa\(\)](#)

Other internode functions: [is_internode\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
internodes(x)
```

is_classification *Check if is a classification*

Description

Check if an object is the classification class

Usage

```
is_classification(x)
```

Arguments

x An object to test

is_internode *Check if taxa are internodes*

Description

Check if each taxon is an internode. An internode is a taxon with exactly one supertaxon and one subtaxon. These taxa can be removed without losing information on the relationships of the remaining taxa.

Usage

```
is_internode(x)
```

Arguments

x The object to get internodes for, such as a [taxonomy](#) object.

See Also

Other internode functions: [internodes\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
is_internode(x)
```

is_leaf	<i>Check if taxa are leaves</i>
---------	---------------------------------

Description

Check if each taxon is a leaf. A leaf is a taxon with no subtaxa. subtaxa.

Usage

```
is_leaf(x)
```

Arguments

x The object to get leaves for, such as a [taxonomy](#) object

See Also

Other leaf functions: [leaves\(\)](#), [n_leaves\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
is_leaf(x)
```

is_root	<i>Test if taxa are roots</i>
---------	-------------------------------

Description

Check if each taxon is a root. A root is a taxon with no supertaxon.

Usage

```
is_root(x, subset = NULL)
```

Arguments

- x An object containing taxonomic relationships, such as [taxonomy](#) objects.
- subset The subset of the tree to search for roots to that subset. Can be indexes or names.

See Also

Other root functions: [roots\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
              supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
is_root(x)
is_root(x, subset = 2:8)
```

is_stem

Check if taxa are stems

Description

Check if each taxon is a stem. A stem is any taxa from a root to the first taxon with multiple subtaxa.

Usage

```
is_stem(x)
```

Arguments

- x An object with taxonomic relationships, like [taxonomy](#) objects.

See Also

Other stem functions: [stems\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris'),
              supertaxa = c(NA, 1, 2, 3, 3))
is_stem(x)
```

is_taxon	<i>Check if something is a taxon object</i>
----------	---

Description

Check if an object is of the [taxon](#) class

Usage

```
is_taxon(x)
```

Arguments

x	An object to test
---	-------------------

Examples

```
x <- taxon(c('A', 'B', 'C'))
is_taxon(x)
is_taxon(1:2)
```

is_taxonomy	<i>Check if something is a taxonomy</i>
-------------	---

Description

Check if an object is of the [taxonomy](#) class

Usage

```
is_taxonomy(x)
```

Arguments

x	An object to test
---	-------------------

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
              supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
is_taxonomy(x)
is_taxonomy(1:2)
```

is_taxon_authority *Check if is a [taxon_authority](#)*

Description

Check if an object is of the [taxon_authority](#) class

Usage

```
is_taxon_authority(x)
```

Arguments

x An object to test

Examples

```
x <- taxon_authority(c('Cham. & Schldl.', 'L.'),
                    date = c('1827', '1753'))
is_taxon_authority(x)
is_taxon_authority(1:3)
```

is_taxon_db *Check if something is a [taxon_db](#)*

Description

Check if an object is of the [taxon_db](#) class

Usage

```
is_taxon_db(x)
```

Arguments

x An object to test

Examples

```
x <- taxon_db(c('ncbi', 'ncbi', 'itis'))
is_taxon_db(x)
is_taxon_db(1:3)
```

is_taxon_id	<i>Check if something is a taxon_id object</i>
-------------	--

Description

Check if an object is of the [taxon_id](#) class

Usage

```
is_taxon_id(x)
```

Arguments

x An object to test

Examples

```
x <- taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi')
is_taxon_id(x)
is_taxon_id(1:3)
```

is_taxon_rank	<i>Check if something is a taxon_rank</i>
---------------	---

Description

Check if an object is of the [taxon_rank](#) class

Usage

```
is_taxon_rank(x)
```

Arguments

x An object to test

Examples

```
x <- taxon_rank(c('species', 'species', 'phylum', 'family'))
is_taxon_rank(x)
is_taxon_rank(1:3)
```

leaves	<i>Get leaves</i>
--------	-------------------

Description

Get leaves indexes for each taxon or another per-taxon value. Leaves are taxa with no subtaxa.

Usage

```
leaves(x, value = NULL, ...)
```

Arguments

x	The object to get leaves for, such as a taxonomy object
value	Something to return instead of indexes. Must be the same length as the number of taxa.
...	Additional arguments.

See Also

Other taxonomy functions: [internodes\(\)](#), [roots\(\)](#), [stems\(\)](#), [subtaxa\(\)](#), [supertaxa\(\)](#)
 Other leaf functions: [is_leaf\(\)](#), [n_leaves\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
leaves(x)
leaves(x, value = tax_name(x))
```

n_leaves	<i>Number of leaves per taxon</i>
----------	-----------------------------------

Description

Get the number of leaves per taxon. A leaf is a taxon with no subtaxa.

Usage

```
n_leaves(x)
```

Arguments

x	The object to get leaves for, such as a taxonomy object
---	---

See Also

Other leaf functions: [is_leaf\(\)](#), [leaves\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
              supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
n_leaves(x)
```

n_subtaxa	<i>Number of subtaxa per taxon</i>
-----------	------------------------------------

Description

Get the number of subtaxa per taxon.

Usage

```
n_subtaxa(x, subset = NULL, max_depth = NULL, include = FALSE)
```

Arguments

x	The object to get subtaxa for, such as a taxonomy object.
subset	The subset of the tree to search. Can be indexes or names.
max_depth	The number of ranks to traverse. For example, <code>max_depth = 1</code> returns only immediate subtaxa. By default (NULL) information for all subtaxa is returned (i.e. subtaxa of subtaxa, etc).
include	If TRUE, include information for each taxon in the output.

See Also

Other subtaxa functions: [subtaxa\(\)](#)

Examples

```
# Generate example data
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
              supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))

# Find number of subtaxa (including subtaxa of subtaxa, etc)
n_subtaxa(x)

# Find the number of subtaxa one rank below each taxon
n_subtaxa(x, max_depth = 1)
```

```
# Only return data for some taxa (faster than subsetting the whole result)
n_subtaxa(x, subset = 1:3)
```

n_supertaxa	<i>Number of supertaxa per taxon</i>
-------------	--------------------------------------

Description

Get the number of supertaxa each taxon is contained in.

Usage

```
n_supertaxa(x, subset = NULL, max_depth = NULL, include = FALSE)
```

Arguments

x	The object to get supertaxa for, such as a taxonomy object.
subset	The subset of the tree to search for roots to that subset. Can be indexes or names.
max_depth	The number of levels to traverse. For example, max_depth = 1 returns only immediate supertaxa. By default (NULL) information for all supertaxa is returned.
include	If TRUE, include information for each taxon in the output.

See Also

Other supertaxa functions: [supertaxa\(\)](#)

Examples

```
# Generate example data
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))

# Find number of supertaxa each taxon is contained in
n_supertaxa(x)

# Only return data for some taxa (faster than subsetting the whole result)
n_supertaxa(x, subset = 1:3)
```

roots	<i>Get root taxa</i>
-------	----------------------

Description

Get the indexes of root taxa in a taxonomy.

Usage

```
roots(x, subset = NULL)
```

Arguments

x	An object containing taxonomic relationships, such as taxonomy objects.
subset	The subset of the tree to search for roots to that subset. Can be indexes or names.

See Also

Other taxonomy functions: [internodes\(\)](#), [leaves\(\)](#), [stems\(\)](#), [subtaxa\(\)](#), [supertaxa\(\)](#)
 Other root functions: [is_root\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
                'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
              supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))
roots(x)
roots(x, subset = 2:8)
```

stems	<i>Get stems</i>
-------	------------------

Description

Get stem indexes for each taxon or another per-taxon value.

Usage

```
stems(x, value = NULL, ...)
```

Arguments

x	An object with taxonomic relationships, like taxonomy objects.
value	Something to return instead of indexes. Must be the same length as the number of taxa.
...	Additional arguments.

See Also

Other taxonomy functions: [internodes\(\)](#), [leaves\(\)](#), [roots\(\)](#), [subtaxa\(\)](#), [supertaxa\(\)](#)

Other stem functions: [is_stem\(\)](#)

Examples

```
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris'),
             supertaxa = c(NA, 1, 2, 3, 3))
x <- c(x, x)
stems(x)
stems(x, value = tax_name(x))
```

subtaxa

Get subtaxa

Description

Get subtaxa indexes for each taxon or another per-taxon value. Subtaxa are taxa contained within a taxon.

Usage

```
subtaxa(x, subset = NULL, max_depth = NULL, include = FALSE, value = NULL, ...)
```

Arguments

<code>x</code>	The object to get subtaxa for, such as a taxonomy object.
<code>subset</code>	The subset of the tree to search. Can be indexes or names.
<code>max_depth</code>	The number of ranks to traverse. For example, <code>max_depth = 1</code> returns only immediate subtaxa. By default (NULL) information for all subtaxa is returned (i.e. subtaxa of subtaxa, etc).
<code>include</code>	If TRUE, include information for each taxon in the output.
<code>value</code>	Something to return instead of indexes. Must be the same length as the number of taxa.
<code>...</code>	Additional arguments.

See Also

Other taxonomy functions: [internodes\(\)](#), [leaves\(\)](#), [roots\(\)](#), [stems\(\)](#), [supertaxa\(\)](#)

Other subtaxa functions: [n_subtaxa\(\)](#)

Examples

```
# Generate example data
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))

# The indexes of all subtaxa (with subtaxa of subtaxa, etc) for each taxon
subtaxa(x)

# The indexes of immediate subtaxa (without subtaxa of subtaxa, etc) for each taxon
subtaxa(x, max_depth = 1)

# Return something other than index
subtaxa(x, value = tax_name(x))

# Include each taxon with its subtaxa
subtaxa(x, value = tax_name(x), include = TRUE)

# Only return data for some taxa (faster than subsetting the whole result)
subtaxa(x, subset = 3)
```

supertaxa

Get supertaxa

Description

Get supertaxa indexes for each taxon or another per-taxon value. Supertaxa are taxa a taxon is contained in.

Usage

```
supertaxa(
  x,
  subset = NULL,
  max_depth = NULL,
  include = FALSE,
  value = NULL,
  use_na = FALSE,
  ...
)
```

Arguments

x	The object to get supertaxa for, such as a taxonomy object.
subset	The subset of the tree to search for roots to that subset. Can be indexes or names.
max_depth	The number of levels to traverse. For example, max_depth = 1 returns only immediate supertaxa. By default (NULL) information for all supertaxa is returned.

include	If TRUE, include information for each taxon in the output.
value	Something to return instead of indexes. Must be the same length as the number of taxa.
use_na	Add a NA to represent the root of the taxonomy (i.e. no supertaxon)
...	Additional arguments.

See Also

Other taxonomy functions: [internodes\(\)](#), [leaves\(\)](#), [roots\(\)](#), [stems\(\)](#), [subtaxa\(\)](#)

Other supertaxa functions: [n_supertaxa\(\)](#)

Examples

```
# Generate example data
x <- taxonomy(c('Carnivora', 'Felidae', 'Panthera', 'Panthera leo',
               'Panthera tigris', 'Ursidae', 'Ursus', 'Ursus arctos'),
             supertaxa = c(NA, 1, 2, 3, 3, 1, 6, 7))

# The indexes of all supertaxa (with supertaxa of supertaxa, etc) for each taxon
supertaxa(x)

# Return something other than index
supertaxa(x, value = tax_name(x))

# Include each taxon with its supertaxa
supertaxa(x, value = tax_name(x), include = TRUE)

# Only return data for some taxa (faster than subsetting the whole result)
supertaxa(x, subset = 3)
```

taxa_taxon-class	<i>Taxon class</i>
------------------	--------------------

Description

Taxon class. See [taxon](#) for more information

taxa_taxonomy-class	<i>Taxonomy class</i>
---------------------	-----------------------

Description

Taxonomy class. See [taxonomy](#) for more information

taxa_taxon_authority-class
Taxon authority class

Description

Taxon authority class. See [taxon_authority](#) for more information

taxa_taxon_db-class *Taxon database class*

Description

Taxon database class. See [taxon_db](#) for more information

taxa_taxon_id-class *Taxon ID class*

Description

Taxon ID class. See [taxon_id](#) for more information

taxa_taxon_rank-class *Taxon rank class*

Description

Taxon rank class. See [taxon_rank](#) for more information

taxon	<i>Taxon class</i>
-------	--------------------

Description

Maturing Used to store information about taxa, such as names, ranks, and IDs.

Usage

```
taxon(name = character(0), rank = NA, id = NA, auth = NA, .names = NA, ...)
```

Arguments

name	The names of taxa. Inputs with be coerced into a character vector if anything else is given.
rank	The ranks of taxa. Inputs with be coerced into a taxon_rank vector if anything else is given.
id	The ids of taxa. These should be unique identifier and are usually associated with a database. Inputs with be coerced into a taxon_id vector if anything else is given.
auth	The authority of the taxon. Inputs with be coerced into a taxon_authority vector if anything else is given.
.names	The names of the vector.
...	Additional arguments.

Value

An S3 object of class `taxa_taxon`

See Also

Other classes: [[.taxa_classification\(\)](#), [classification\(\)](#), [taxon_authority\(\)](#), [taxon_db\(\)](#), [taxon_id\(\)](#), [taxon_rank\(\)](#)]

Examples

```
# Create taxon name vector
x <- taxon(c('A', 'B', 'C'))
x <- taxon(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
           rank = c('species', 'genus', 'phylum', 'family'),
           id = taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
           auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))
names(x) <- c('a', 'b', 'c', 'd')

# Get parts of the taxon name vector
tax_name(x)
tax_rank(x)
```

```

tax_id(x)
tax_db(x)
tax_auth(x)
tax_author(x)
tax_date(x)
tax_cite(x)

# Set parts of the taxon name vector
tax_name(x) <- tolower(taxon_name(x))
tax_rank(x)[1] <- NA
tax_name(x)['b'] <- 'Billy'
tax_id(x) <- '9999'
tax_db(x) <- 'itis'
tax_auth(x) <- NA
tax_author(x)[2:3] <- c('Joe', 'Billy')
tax_date(x) <- c('1999', '2013', '1796', '1899')
tax_cite(x)[1] <- 'Linnaeus, C. (1771). Mantissa plantarum altera generum.'

# Manipulate taxon name vectors
x[1:3]
x[tax_rank(x) > 'family']
x['b'] <- NA
x[c('c', 'd')] <- 'unknown'
is.na(x)

# Use as columns in tables
tibble::tibble(x = x, y = 1:4)
data.frame(x = x, y = 1:4)

# Converting to tables
tibble::as_tibble(x)
as_data_frame(x)

```

taxon_authority

Taxon authority class

Description

Maturing Used to store information on taxon authorities, such as author names, date, and citation.

Usage

```

taxon_authority(
  author = character(),
  date = NA,
  citation = NA,
  .names = NA,
  extract_date = TRUE
)

```

Arguments

author	Zero or more author names.
date	Zero or more dates.
citation	Zero or more literature citations.
.names	The names of the vector.
extract_date	If TRUE (the default), then if a date is detected in the author input and no date input is given, then the date is separated from the author input.

Value

An S3 object of class `taxa_taxon_authority`

See Also

Other classes: [\[.taxa_classification\(\)\]](#), [classification\(\)](#), [taxon_db\(\)](#), [taxon_id\(\)](#), [taxon_rank\(\)](#), [taxon\(\)](#)

Examples

```
# Making new objects
x <- taxon_authority(c('A', 'B', 'C'))
x <- taxon_authority(c('Cham. & Schldl.', 'L.'),
                     date = c('1827', '1753'))

# Manipulating objects
as.character(x)
x[2]
x[2] <- 'ABC'
names(x) <- c('a', 'b')
x['b'] <- 'David Bowie'
tax_author(x)[1] <- tolower(tax_author(x)[1])
tax_author(x)
tax_date(x) <- c('2000', '1234')
tax_date(x)
tax_cite(x)[2] <- c('Linnaeus, C. (1771). Mantissa plantarum altera generum.')
tax_cite(x)

# Using as columns in tables
tibble::tibble(x = x, y = 1:2)
data.frame(x = x, y = 1:2)

# Converting to tables
tibble::as_tibble(x)
as_data_frame(x)
```

taxon_db	<i>Taxon database class</i>
----------	-----------------------------

Description

Maturing Used to store the names of taxon databases defined in [db_ref](#). Primarily used in other classes like [taxon_id](#) to define databases for each item.

Usage

```
taxon_db(db = character(), .names = NULL, ...)
```

Arguments

db	Zero or more taxonomic database names. Should be a name contained in db_ref . Inputs will be transformed to a character vector if possible.
.names	The names of the vector.
...	Additional arguments.

Value

An S3 object of class `taxa_taxon_db`

See Also

Other classes: [[.taxa_classification\(\)](#), [classification\(\)](#), [taxon_authority\(\)](#), [taxon_id\(\)](#), [taxon_rank\(\)](#), [taxon\(\)](#)]

Examples

```
# Making new objects
x <- taxon_db(c('ncbi', 'ncbi', 'itis'))
x

# Manipulating objects
as.character(x)
x[2:3]
x[2:3] <- 'nbn'
names(x) <- c('a', 'b', 'c')
x['b']
x['b'] <- 'nbn'
x[x == 'itis'] <- 'gbif'

# Using as columns in tables
tibble::tibble(x = x, y = 1:3)
data.frame(x = x, y = 1:3)

# Converting to tables
tibble::as_tibble(x)
```

```

as_data_frame(x)

# Trying to use an invalid database generates an error
# x <- taxon_db(c('ncbi', 'ncbi', 'my_custom_db'))
# x[x == 'itis'] <- 'my_custom_db'

# Listing known databases and their properties
db_ref$get()

# Adding and using a new database
db_ref$set(name = 'my_custom_db', desc = 'I just made this up')
db_ref$get()
x <- taxon_db(c('ncbi', 'ncbi', 'my_custom_db'))

```

taxon_id

Taxon ID class

Description

Maturing Used to store the ID corresponding to taxa, either arbitrary or from a particular taxonomy database. This is typically used to store taxon IDs in [taxon](#) objects.

Usage

```
taxon_id(id = character(), db = NA, .names = NULL)
```

Arguments

id	Zero or more taxonomic ids. Inputs will be transformed to a character vector if possible.
db	The name(s) of the database(s) associated with the IDs. If not NA (the default), the input must consist of names of databases in db_ref\$get() .
.names	The names that will be applied to the vector.

Value

An S3 object of class `taxa_taxon_id`

See Also

Other classes: [\[.taxa_classification\(\)](#), [classification\(\)](#), [taxon_authority\(\)](#), [taxon_db\(\)](#), [taxon_rank\(\)](#), [taxon\(\)](#)

Examples

```

# Making new objects
x <- taxon_id(c('A', 'B', 'C'))
x <- taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi')
x <- taxon_id(c('9606', '1386', '4890', '4345'),
              db = c('ncbi', 'ncbi', 'itis', 'itis'))
names(x) <- c('a', 'b', 'c', 'd')

# Manipulating objects
as.character(x)
x[2:3]
x[2:3] <- 'ABC'
x[c('a', 'c')] <- '123'
x[['b']] <- taxon_id('123423', db = 'ncbi')
tax_db(x)
tax_db(x) <- 'nbn'
c(x, x)

# Using as columns in tables
tibble::tibble(x = x, y = 1:4)
data.frame(x = x, y = 1:4)

# Convert to tables
tibble::as_tibble(x)
as_data_frame(x)

# Trying to use an invalid ID with a specified database causes an error
#taxon_id('NOLETTERS', db = 'ncbi')

```

taxon_rank

Taxon rank class

Description

Maturing Used to store taxon ranks, possibly associated with a taxonomy database. This is typically used to store taxon ranks in [taxon](#) objects.

Usage

```

taxon_rank(
  rank = character(),
  .names = NULL,
  levels = NULL,
  guess_order = TRUE
)

```

Arguments

rank	Zero or more taxonomic rank names. Inputs will be transformed to a character vector.
.names	The names of the vector
levels	A named numeric vector indicating the names and orders of possible taxonomic ranks. Higher numbers indicate for fine-scale groupings. Ranks of unknown order can be indicated with NA instead of a number.
guess_order	If TRUE and no rank order is given using numbers, try to guess order based on rank names.

Value

An S3 object of class `taxa_taxon_rank`

See Also

Other classes: [\[.taxa_classification\(\)](#), [classification\(\)](#), [taxon_authority\(\)](#), [taxon_db\(\)](#), [taxon_id\(\)](#), [taxon\(\)](#)

Examples

```
# Making new objects
x <- taxon_rank(c('species', 'species', 'phylum', 'family'))

# Specifiying level order
taxon_rank(c('A', 'B', 'C', 'D', 'A', 'D', 'D'),
           levels = c('D', 'C', 'B', 'A'))
taxon_rank(c('A', 'B', 'C', 'D', 'A', 'D', 'D'),
           levels = c(D = NA, A = 10, B = 20, C = 30))
names(x) <- c('a', 'b', 'c', 'd')

# Manipulating objects
as.character(x)
as.factor(x)
as.ordered(x)
x[2:3]
x[x > 'family'] <- taxon_rank('unknown')
x[1] <- taxon_rank('order')
x['b']
x['b'] <- 'order'

# Using as columns in tables
tibble::tibble(x = x, y = 1:4)
data.frame(x = x, y = 1:4)

# Converting to tables
tibble::as_tibble(x)
as_data_frame(x)

# Trying to add an unknown level as a character causes an error
```

```
#x[2] <- 'superkingdom'  
  
# But you can add a new level using taxon_rank objects  
x[2] <- taxon_rank('superkingdom')
```

tax_auth.taxa_classification

Set and get taxon authorities

Description

Set and get the taxon authorities in objects that have them, such as [taxon](#) objects. Note that this sets all the authority information, such as author name, date, and citations. To set or get just one of part of the authorities, use [tax_author](#), [tax_date](#), or [tax_cite](#) instead.

Usage

```
## S3 method for class 'taxa_classification'  
tax_auth(x)  
  
## S3 replacement method for class 'taxa_classification'  
tax_auth(x) <- value  
  
tax_auth(x)  
  
tax_auth(x) <- value  
  
## S3 method for class 'taxa_taxon'  
tax_auth(x)  
  
## S3 replacement method for class 'taxa_taxon'  
tax_auth(x) <- value  
  
## S3 method for class 'taxa_taxonomy'  
tax_auth(x)  
  
## S3 replacement method for class 'taxa_taxonomy'  
tax_auth(x) <- value
```

Arguments

x	An object with taxon authorities.
value	The taxon IDs to set. Inputs will be coerced into a taxon_id vector.

Examples

```
x <- taxon(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
           rank = c('species', 'genus', 'phylum', 'family'),
           id = taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
           auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))

tax_auth(x)
tax_auth(x) <- tolower(tax_auth(x))
tax_auth(x)[1] <- 'Billy'
```

```
tax_author.taxa_classification
      Set and get taxon authors
```

Description

Set and get taxon authors in objects that have them, such as [taxon_authority](#) objects.

Usage

```
## S3 method for class 'taxa_classification'
tax_author(x)

## S3 replacement method for class 'taxa_classification'
tax_author(x) <- value

tax_author(x)

tax_author(x) <- value

## S3 method for class 'taxa_taxon'
tax_author(x)

## S3 replacement method for class 'taxa_taxon'
tax_author(x) <- value

## S3 replacement method for class 'taxa_taxon_authority'
tax_author(x) <- value

## S3 method for class 'taxa_taxon_authority'
tax_author(x)

## S3 method for class 'taxa_taxonomy'
tax_author(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_author(x) <- value
```

Arguments

`x` An object with taxon authors.
`value` The taxon authors to set. Inputs will be coerced into a [character](#) vector.

Examples

```
x <- taxon_authority(c('Cham. & Schldl.', 'L.'),
                    date = c('1827', '1753'))
tax_author(x)
tax_author(x)[1] <- "Billy"
tax_author(x) <- tolower(tax_author(x))
```

```
tax_cite.taxa_classification
      Set and get taxon authority citations
```

Description

Set and get the taxon authority citations in objects that have them, such as [taxon_authority](#) objects.

Usage

```
## S3 method for class 'taxa_classification'
tax_cite(x)

## S3 replacement method for class 'taxa_classification'
tax_cite(x) <- value

tax_cite(x)

tax_cite(x) <- value

## S3 method for class 'taxa_taxon'
tax_cite(x)

## S3 replacement method for class 'taxa_taxon'
tax_cite(x) <- value

## S3 replacement method for class 'taxa_taxon_authority'
tax_cite(x) <- value

## S3 method for class 'taxa_taxon_authority'
tax_cite(x)

## S3 method for class 'taxa_taxonomy'
tax_cite(x)
```

```
## S3 replacement method for class 'taxa_taxonomy'
tax_cite(x) <- value
```

Arguments

x An object with taxon authority dates.

value The taxon citations to set. Inputs will be coerced into a [taxon_authority](#) vector.

Examples

```
x <- taxa_authority(c('Cham. & Schldl.', 'L.'),
                    date = c('1827', '1753'),
                    citation = c(NA, 'Species Plantarum'))
tax_cite(x)
tax_cite(x)[1] <- "Cham. et al 1984"
```

```
tax_date.taxa_classification
Set and get taxon authority dates
```

Description

Set and get the taxon authority dates in objects that have them, such as [taxon_authority](#) objects.

Usage

```
## S3 method for class 'taxa_classification'
tax_date(x)

## S3 replacement method for class 'taxa_classification'
tax_date(x) <- value

tax_date(x)

tax_date(x) <- value

## S3 method for class 'taxa_taxon'
tax_date(x)

## S3 replacement method for class 'taxa_taxon'
tax_date(x) <- value

## S3 replacement method for class 'taxa_taxon_authority'
tax_date(x) <- value
```



```
## S3 method for class 'taxa_taxon_authority'
tax_date(x)

## S3 method for class 'taxa_taxonomy'
tax_date(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_date(x) <- value
```

Arguments

x An object with taxon authority dates.

value The taxon authority dates to set. Inputs will be coerced into a [character](#) vector.

Examples

```
x <- taxon_authority(c('Cham. & Schldl.', 'L.'),
                    date = c('1827', '1753'))
tax_date(x)
tax_date(x)[1] <- "1984"
tax_date(x) <- c(NA, '1800')
```

```
tax_db.taxa_classification
Set and get taxon ID databases
```

Description

Set and get the taxon ID databases in objects that have them, such as [taxon_id](#) objects.

Usage

```
## S3 method for class 'taxa_classification'
tax_db(x)

## S3 replacement method for class 'taxa_classification'
tax_db(x) <- value

tax_db(x)

tax_db(x) <- value

## S3 method for class 'taxa_taxon'
tax_db(x)

## S3 replacement method for class 'taxa_taxon'
```

```
tax_db(x) <- value

## S3 method for class 'taxa_taxon_id'
tax_db(x)

## S3 replacement method for class 'taxa_taxon_id'
tax_db(x) <- value

## S3 method for class 'taxa_taxonomy'
tax_db(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_db(x) <- value
```

Arguments

`x` An object with taxon authority dates.
`value` The taxon citations to set. Inputs will be coerced into a [taxon_db](#) vector.

Examples

```
x <- taxa_id(c('9606', '1386', '4890', '4345'), db = 'ncbi')
tax_db(x)
tax_db(x) <- 'nbn'
tax_db(x)[2] <- 'itis'
```

tax_id.taxa_classification
Set and get taxon IDs

Description

Set and get the taxon IDs in objects that have them, such as [taxon](#) objects.

Usage

```
## S3 method for class 'taxa_classification'
tax_id(x)

## S3 replacement method for class 'taxa_classification'
tax_id(x) <- value

tax_id(x)

tax_id(x) <- value
```

```
## S3 method for class 'taxa_taxon'
tax_id(x)

## S3 replacement method for class 'taxa_taxon'
tax_id(x) <- value

## S3 method for class 'taxa_taxonomy'
tax_id(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_id(x) <- value
```

Arguments

x An object with taxon IDs.

value The taxon IDs to set. Inputs will be coerced into a [taxon_id](#) vector.

Examples

```
x <- taxa(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
          rank = c('species', 'genus', 'phylum', 'family'),
          id = taxa_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
          auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))

tax_id(x)
tax_id(x) <- paste0('00', tax_id(x))
tax_id(x)[1] <- '00000'
```

```
tax_name.taxa_classification
Set and get taxon names
```

Description

Set and get the taxon names in objects that have them, such as [taxon](#) objects. Note that this is not the same as adding vector names with [names](#).

Usage

```
## S3 method for class 'taxa_classification'
tax_name(x)

## S3 replacement method for class 'taxa_classification'
tax_name(x) <- value

tax_name(x)
```

```

tax_name(x) <- value

## S3 method for class 'taxa_taxon'
tax_name(x)

## S3 replacement method for class 'taxa_taxon'
tax_name(x) <- value

## S3 method for class 'taxa_taxonomy'
tax_name(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_name(x) <- value

```

Arguments

x An object with taxon names.

value The taxon names to set. Inputs will be coerced into a [character](#) vector.

Examples

```

x <- taxon(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
           rank = c('species', 'genus', 'phylum', 'family'),
           id = taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
           auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))

tax_name(x)
tax_name(x) <- tolower(tax_name(x))
tax_name(x)[1] <- 'Billy'

```

tax_rank.taxa_classification
Set and get taxon ranks

Description

Set and get the taxon ranks in objects that have them, such as [taxon](#) objects.

Usage

```

## S3 method for class 'taxa_classification'
tax_rank(x)

## S3 replacement method for class 'taxa_classification'
tax_rank(x) <- value

tax_rank(x)

```

```
tax_rank(x) <- value

## S3 method for class 'taxa_taxon'
tax_rank(x)

## S3 replacement method for class 'taxa_taxon'
tax_rank(x) <- value

## S3 method for class 'taxa_taxonomy'
tax_rank(x)

## S3 replacement method for class 'taxa_taxonomy'
tax_rank(x) <- value
```

Arguments

x An object with taxon ranks.
value The taxon ranks to set. Inputs will be coerced into a [taxon_rank](#) vector.

Examples

```
x <- taxon(name = c('Homo sapiens', 'Bacillus', 'Ascomycota', 'Ericaceae'),
           rank = c('species', 'genus', 'phylum', 'family'),
           id = taxon_id(c('9606', '1386', '4890', '4345'), db = 'ncbi'),
           auth = c('Linnaeus, 1758', 'Cohn 1872', NA, 'Juss., 1789'))

tax_rank(x)
tax_rank(x) <- 'species'
tax_rank(x)[1] <- taxon_rank('family')
```

%in% *Value matching for taxa package*

Description

A wrapper for the base value matching `%in%` that is used to take into consideration features of the taxa package.

Usage

```
x %in% table
```

Arguments

x vector or NULL: the values to be matched. [Long vectors](#) are supported.
table vector or NULL: the values to be matched against. [Long vectors](#) are not supported.

Index

- * **classes**
 - classification, 4
 - taxon, 22
 - taxon_authority, 23
 - taxon_db, 25
 - taxon_id, 26
 - taxon_rank, 27
- * **datasets**
 - db_ref, 6
- * **internode functions**
 - internodes, 7
 - is_internode, 8
- * **leaf functions**
 - is_leaf, 9
 - leaves, 14
 - n_leaves, 14
- * **root functions**
 - is_root, 9
 - roots, 17
- * **stem functions**
 - is_stem, 10
 - stems, 17
- * **subtaxa functions**
 - n_subtaxa, 15
 - subtaxa, 18
- * **supertaxa functions**
 - n_supertaxa, 16
 - supertaxa, 19
- * **taxonomy functions**
 - internodes, 7
 - leaves, 14
 - roots, 17
 - stems, 17
 - subtaxa, 18
 - supertaxa, 19
- [.taxa_classification, 5, 22, 24–26, 28
- %in%, 37
- as_data_frame, 3
- as_taxon, 4
- as_tibble, 3
- character, 22, 25, 26, 28, 31, 33, 36
- classification, 4, 22, 24–26, 28
- data.frame, 3
- db_ref, 6, 25
- db_ref\$get(), 26
- internodes, 7, 8, 14, 17, 18, 20
- is_classification, 8
- is_internode, 7, 8
- is_leaf, 9, 14, 15
- is_root, 9, 17
- is_stem, 10, 18
- is_taxon, 11
- is_taxon_authority, 12
- is_taxon_db, 12
- is_taxon_id, 13
- is_taxon_rank, 13
- is_taxonomy, 11
- knitr, 7
- leaves, 7, 9, 14, 15, 17, 18, 20
- Long vectors, 37
- make.names, 3
- n_leaves, 9, 14, 14
- n_subtaxa, 15, 18
- n_supertaxa, 16, 20
- names, 35
- roots, 7, 10, 14, 17, 18, 20
- stems, 7, 10, 14, 17, 17, 18, 20
- subtaxa, 7, 14, 15, 17, 18, 18, 20
- supertaxa, 7, 14, 16–18, 19

- tax_auth
 - (tax_auth.taxa_classification), 29
- tax_auth.taxa_classification, 29
- tax_auth<-
 - (tax_auth.taxa_classification), 29
- tax_author, 29
- tax_author
 - (tax_author.taxa_classification), 30
- tax_author.taxa_classification, 30
- tax_author<-
 - (tax_author.taxa_classification), 30
- tax_cite, 29
- tax_cite
 - (tax_cite.taxa_classification), 31
- tax_cite.taxa_classification, 31
- tax_cite<-
 - (tax_cite.taxa_classification), 31
- tax_date, 29
- tax_date
 - (tax_date.taxa_classification), 32
- tax_date.taxa_classification, 32
- tax_date<-
 - (tax_date.taxa_classification), 32
- tax_db (tax_db.taxa_classification), 33
- tax_db.taxa_classification, 33
- tax_db<- (tax_db.taxa_classification), 33
- tax_id (tax_id.taxa_classification), 34
- tax_id.taxa_classification, 34
- tax_id<- (tax_id.taxa_classification), 34
- tax_name
 - (tax_name.taxa_classification), 35
- tax_name.taxa_classification, 35
- tax_name<-
 - (tax_name.taxa_classification), 35
- tax_rank
 - (tax_rank.taxa_classification), 36
- tax_rank.taxa_classification, 36
- tax_rank<-
 - (tax_rank.taxa_classification), 36
- taxa_taxon (taxa_taxon-class), 20
- taxa_taxon-class, 20
- taxa_taxon_authority
 - (taxa_taxon_authority-class), 21
- taxa_taxon_authority-class, 21
- taxa_taxon_db (taxa_taxon_db-class), 21
- taxa_taxon_db-class, 21
- taxa_taxon_id (taxa_taxon_id-class), 21
- taxa_taxon_id-class, 21
- taxa_taxon_rank
 - (taxa_taxon_rank-class), 21
- taxa_taxon_rank-class, 21
- taxa_taxonomy (taxa_taxonomy-class), 20
- taxa_taxonomy-class, 20
- taxon, 3–6, 11, 20, 22, 24–29, 34–36
- taxon constructor, 4
- taxon_authority, 5, 12, 21, 22, 23, 25, 26, 28, 30–32
- taxon_db, 5, 6, 12, 21, 22, 24, 25, 26, 28, 34
- taxon_id, 3, 5, 6, 13, 21, 22, 24, 25, 26, 28, 29, 33, 35
- taxon_rank, 5, 13, 21, 22, 24–26, 27, 37
- taxonomy, 5, 7–11, 14–20