Package ‘taxadb’

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Title A High-Performance Local Taxonomic Database Interface

Description Creates a local database of many commonly used taxonomic authorities and provides functions that can quickly query this data.

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Author Carl Boettiger [aut, cre] (<https://orcid.org/0000-0002-1642-628X>), Kari Norman [aut] (<https://orcid.org/0000-0002-2029-2325>), Jorrit Poelen [aut] (<https://orcid.org/0000-0003-3138-4118>), Scott Chamberlain [aut] (<https://orcid.org/0000-0003-1444-9135>), Noam Ross [ctb] (<https://orcid.org/0000-0002-2136-0000>)

Maintainer Carl Boettiger <cboettig@gmail.com>

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R topics documented:

- clean_names ........................................ 2
- common_contains ..................................... 3
- common_starts_with ................................. 4
- filter_by ............................................. 5
- filter_common ........................................ 6
- filter_id ............................................. 7
- filter_name .......................................... 9
- filter_rank .......................................... 10
- fuzzy_filter ......................................... 11
- get_ids .............................................. 12
- get_names ........................................... 14
- mutate_db ............................................ 15
- name_contains ....................................... 16
- name_starts_with .................................... 16
- taxadb_dir .......................................... 17
- taxa_tbl ............................................. 18
- td_connect ......................................... 19
- td_create ........................................... 20
- td_disconnect ....................................... 21
- tl_import ........................................... 22

Index ................................. 24

---

clean_names

Clean taxonomic names

Description

A utility to sanitize taxonomic names to increase probability of resolving names.

Usage

clean_names(
  names,
  fix_delim = TRUE,
  binomial_only = TRUE,
  remove_sp = TRUE,
  ascii_only = TRUE,
  lowercase = TRUE,
  remove_punc = FALSE
)
common_contains

Arguments

names: a character vector of taxonomic names (usually species names)
fix_delim: Should we replace separators ., _ - with spaces? e.g. 'Homo.sapiens' becomes 'Homo sapiens'. logical, default TRUE.
binomial_only: Attempt to prune name to a binomial name, e.g. Genus and species (specific epithet), e.g. Homo sapiens sapiens becomes Homo sapiens. logical, default TRUE.
remove_sp: Should we drop unspecified species epithet designations? e.g. Homo sp. becomes Homo (thus only matching against genus level ids). logical, default TRUE.
ascii_only: should we coerce strings to ascii characters? (see stringi::stri_trans_general())
lowercase: should names be coerced to lower-case to provide case-insensitive matching?
remove_punc: replace all punctuation but apostrophes with a space, remove apostrophes

Details

Current implementation is limited to handling a few common cases. Additional extensions may be added later. A goal of the clean_names function is that any modification rule of the name strings be precise, atomic, and toggle-able, rather than relying on clever but more opaque rules and arbitrary scores. This utility should always be used with care, as indiscriminate modification of names may result in successful but inaccurate name matching. A good pattern is to only apply this function to the subset of names that cannot be directly matched.

Examples

clean_names(c("Homo sapiens sapiens", "Homo.sapiens", "Homo sp."))

Description

common name starts with

Usage

clean_names(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
**Arguments**

- **name**: vector of names (scientific or common, see by) to be matched against.
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See [td_create] for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See [tl_import] for details.
- **db**: a connection to the taxadb database. See details.
- **ignore_case**: should we ignore case (capitalization) in matching names? default is TRUE.

**Examples**

```r
commom_starts_with("monkey")
```

**Description**

common name starts with

**Usage**

```r
common_starts_with(
  name,
  provider =getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

**Arguments**

- **name**: vector of names (scientific or common, see by) to be matched against.
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See [td_create] for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See [tl_import] for details.
- **db**: a connection to the taxadb database. See details.
- **ignore_case**: should we ignore case (capitalization) in matching names? default is TRUE.
**Examples**

```r
common_starts_with("monkey")
```

---

**Description**

Creates a data frame with column name given by `by`, and values given by the vector `x`, and then uses this table to do a filtering join, joining on the `by` column to return all rows matching the `x` values (scientific Names, taxonIDs, etc).

**Usage**

```r
filter_by(x, by, provider = getOption("taxadb_default_provider", "itis"),
    schema = c("dwc", "common"),
    version = latest_version(),
    collect = TRUE,
    db = td_connect(),
    ignore_case = TRUE)
```

**Arguments**

- `x` a vector of values to filter on
- `by` a column name in the taxa_tbl (following Darwin Core Schema terms). The filtering join is executed with this column as the joining variable.
- `provider` from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...”). See [td_create] for a list of recognized providers.
- `schema` One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
- `version` Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
- `collect` logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
filter_common

Look up taxonomic information by common name

Description

Look up taxonomic information by common name

Usage

filter_common(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  collect = TRUE,
  ignore_case = TRUE,
  db = td_connect()
)
Arguments

- **name**: a character vector of common (vernacular English) names, e.g. "Humans"
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See `td_create` for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See `tl_import` for details.
- **collect**: logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
- **ignore_case**: should we ignore case (capitalization) in matching names? default is TRUE.
- **db**: a connection to the taxadb database. See details.

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: `filter_by()`, `filter_id()`, `filter_name()`, `filter_rank()`

Examples

```r
filter_common("Pied Tamarin")
```

---

**filter_id**

*Return a taxonomic table matching the requested ids*

Description

Return a taxonomic table matching the requested ids

Usage

```r
filter_id(
  id,
  provider = getOption("taxadb_default_provider", "itis"),
  type = c("taxonID", "acceptedNameUsageID"),
  version = latest_version(),
)```
```r
collect = TRUE,
db = td_connect()
)

Arguments

id          taxonomic id, in prefix format
provider    from which provider should the hierarchy be returned? Default is 'itis', which
can also be configured using options(default_taxadb_provider=...). See
[td_create] for a list of recognized providers.
type        id type. Can be taxonID or acceptedNameUsageID, see details.
version     Which version of the taxadb provider database should we use? defaults to latest.
             See tl_import for details.
collect     logical, default TRUE. Should we return an in-memory data.frame (default, usu-
             ally the most convenient), or a reference to lazy-eval table on disk (useful for
             very large tables on which we may first perform subsequent filtering operations.)
db          a connection to the taxadb database. See details.

Details

Use type="acceptedNameUsageID" to return all rows for which this ID is the accepted ID, includ-
ing both synonyms and and accepted names (since both all synonyms of a name share the same
acceptedNameUsageID.) Use taxonID (default) to only return those rows for which the Scientific
name corresponds to the taxonID.

Some providers (e.g. ITIS) assign taxonIDs to synonyms, most others only assign IDs to accepted
names. In the latter case, this means requesting taxonID will only match accepted names, while
requesting matches to the acceptedNameUsageID will also return any known synonyms. See ex-
amples.

Value

a data.frame with id and name of all matching species

See Also

Other filter_by: filter_by(), filter_common(), filter_name(), filter_rank()

Examples

filter_id(c("ITIS:1077358", "ITIS:175089"))
filter_id("ITIS:1077358", type="acceptedNameUsageID")
```
Look up taxonomic information by scientific name

Usage

```r
filter_name(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  collect = TRUE,
  ignore_case = TRUE,
  db = td_connect()
)
```

Arguments

- **name**: a character vector of scientific names, e.g. "Homo sapiens"
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See [td_create] for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See `tl_import` for details.
- **collect**: logical, default `TRUE`. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
- **ignore_case**: should we ignore case (capitalization) in matching names? default is `TRUE`.
- **db**: a connection to the taxadb database. See details.

Details

Most but not all authorities can match against both species level and higher-level (or lower, e.g. subspecies or variety) taxonomic names. The rank level is indicated by `taxonRank` column.

Most authorities include both known synonyms and accepted names in the `scientificName` column, (with the status indicated by `taxonomicStatus`). This is convenient, as users will typically not know if the names they have are synonyms or accepted names, but will want to get the match to the accepted name and accepted ID in either case.

Value

A data.frame in the Darwin Core tabular format containing the matching taxonomic entities.
### filter_rank

Get all members (descendants) of a given rank level

#### Description

Get all members (descendants) of a given rank level

#### Usage

```r
filter_rank(
  name,  
  rank, 
  provider = getOption("taxadb_default_provider", "itis"), 
  version = latest_version(), 
  collect = TRUE, 
  ignore_case = TRUE, 
  db = td_connect()
)
```

#### Arguments

- **name**: taxonomic scientific name (e.g. "Aves")
- **rank**: taxonomic rank name (e.g. "class")
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
- **collect**: logical, default TRUE. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)
- **ignore_case**: should we ignore case (capitalization) in matching names? default is TRUE.
- **db**: a connection to the taxadb database. See details.

### See Also

Other filter_by: `filter_by()`, `filter_common()`, `filter_id()`, `filter_rank()`

### Examples

```r
sp <- c("Trochalopteron henrici gucenense", "Trochalopteron elliotii")
filter_name(sp)
```
fuzzy_filter

Value

a data.frame in the Darwin Core tabular format containing the matching taxonomic entities.

See Also

Other filter_by: filter_by(), filter_common(), filter_id(), filter_name()

Examples

filter_rank("Aves", "class")

fuzzy_filter

Match names that start or contain a specified text string

Description

Match names that start or contain a specified text string

Usage

fuzzy_filter(  
  name,  
  by = c("scientificName", "vernacularName"),  
  provider = getOption("taxadb_default_provider", "itis"),  
  match = c("contains", "starts_with"),  
  version = latest_version(),  
  db = td_connect(),  
  ignore_case = TRUE,  
  collect = TRUE
  )

Arguments

name vector of names (scientific or common, see by) to be matched against.
by a column name in the taxa_tbl (following Darwin Core Schema terms). The filtering join is executed with this column as the joining variable.
provider from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...”). See [td_create] for a list of recognized providers.
match should we match by names starting with the term or containing the term anywhere in the name?
version Which version of the taxadb provider database should we use? defaults to latest. See `tl_import` for details.
db a connection to the taxadb database. See details.
ignore_case should we ignore case (capitalization) in matching names? default is `TRUE`.
collect logical, default `TRUE`. Should we return an in-memory data.frame (default, usually the most convenient), or a reference to lazy-eval table on disk (useful for very large tables on which we may first perform subsequent filtering operations.)

Details

Note that fuzzy filter will be fast with an single or small number of names, but will be slower if given a very large vector of names to match, as unlike other `filter_` commands, fuzzy matching requires separate SQL calls for each name. As fuzzy matches should all be confirmed manually in any event, e.g. not every common name containing “monkey” belongs to a primate species. This method utilizes the database operation `%like%` to filter tables without loading into memory. Note that this does not support the use of regular expressions at this time.

Examples

```r
## match any common name containing:
name <- c("woodpecker", "monkey")
fuzzy_filter(name, "vernacularName")

## match scientific name
fuzzy_filter("Chera", "scientificName",
match = "starts_with")
```

Description

A drop-in replacement for `taxize::get_ids()`

Usage

```r
get_ids(
  names,
  db = getOption("taxadb_default_provider", "itis"),
  format = c("prefix", "bare", "uri"),
  version = latest_version(),
  taxadb_db = td_connect(),
)```
get_ids

```r
ignore_case = TRUE,
warn = TRUE,
...
```

### Arguments

- **names**
  - a list of scientific names (which may include higher-order ranks in most authorities).

- **db**
  - abbreviation code for the provider. See details.

- **format**
  - Format for the returned identifier, one of
    - `prefix` (e.g. NCBI:9606, the default), or
    - `bare` (e.g. 9606, used in `taxize::get_ids()`),

- **version**
  - Which version of the taxadb provider database should we use? defaults to latest. see `available_releases()` for details.

- **taxadb_db**
  - Connection to from `td_connect()`.

- **ignore_case**
  - should we ignore case (capitalization) in matching names? default is `TRUE`.

- **warn**
  - should we display warnings on NAs resulting from multiply-resolved matches? (Unlike unmatched names, these NAs can usually be resolved manually via `filter_id()`)

  - additional arguments (currently ignored)

### Details

Note that some taxize authorities: nbn, tropicos, and eol, are not recognized by taxadb and will throw an error here. Meanwhile, taxadb recognizes several authorities not known to `[taxize::get_ids()]`. Both include itis, ncbi, col, and gbif.

Like all taxadb functions, this function will run fastest if a local copy of the provider is installed in advance using `[td_create()]`.

### Value

A vector of IDs, of the same length as the input names Any unmatched names or multiply-matched names will return as NAs. To resolve multi-matched names, use `filter_name()` instead to return a table with a separate row for each separate match of the input name.

### See Also

- `filter_name`

Other get: `get_names()`
get_names

Examples

get_ids("Midas bicolor")
get_ids(c("Midas bicolor", "Homo sapiens"), format = "prefix")
get_ids("Midas bicolor", format = "uri")

---

get_names  get_names

description

Translate identifiers into scientific names

Usage

get_names(
  id,
  db = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  format = c("guess", "prefix", "bare", "uri"),
  taxadb_db = td_connect()
)

Arguments

- id: a list of taxonomic identifiers.
- db: abbreviation code for the provider. See details.
- version: Which version of the taxadb provider database should we use? defaults to latest. see [available_releases()] for details.
- format: Format for the returned identifier, one of
  - prefix (e.g. NCBI:9606, the default), or
  - bare (e.g. 9606, used in taxize::get_ids()),
- taxadb_db: Connection to from [td_connect()].

Details

Like all taxadb functions, this function will run fastest if a local copy of the provider is installed in advance using [td_create()].
mutate_db

Value

a vector of names, of the same length as the input ids. Any unmatched IDs will return as NAs.

See Also

Other get: get_ids()

Examples

generate_names(c("ITIS:1025094", "ITIS:1025103"), format = "prefix")

mutate_db

Add new variables to a database

Description

dplyr::mutate() cannot pass arbitrary R functions over a database connection. This function provides a way to work around this, by querying the data in chunks and applying the function to each chunk, which is then appended back out to a temporary table.

Usage

mutate_db(.data, r_fn, col, new_column, n = 5000L, ...)

Arguments

data: A dplyr::tbl that uses a database connection, tbl_dbi class.
r_fn: any R function that can be called on a vector (column) of the table.
col: the name of the column to which the R function is applied. (Note, dplyr::mutate() can operate on an arbitrary list of columns, this function only operates on a single column at this time...)
new_column: column name for the new column.
n: the number of rows included in each chunk, see DBI::dbFetch()
...

Value

a dplyr tbl connection to the temporary table in the database
name_contains

return all taxa in which scientific name contains the text provided

Description

return all taxa in which scientific name contains the text provided

Usage

```r
name_contains(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)
```

Arguments

- **name**: vector of names (scientific or common, see by) to be matched against.
- **provider**: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See [td_create] for a list of recognized providers.
- **version**: Which version of the taxadb provider database should we use? defaults to latest. See [tl_import] for details.
- **db**: a connection to the taxadb database. See details.
- **ignore_case**: should we ignore case (capitalization) in matching names? default is TRUE.

Examples

```r
name_contains("Chera")
```

name_starts_with

scientific name starts with

Description

scientific name starts with
Usage

name_starts_with(
  name,
  provider = getOption("taxadb_default_provider", "itis"),
  version = latest_version(),
  db = td_connect(),
  ignore_case = TRUE
)

Arguments

name vector of names (scientific or common, see by) to be matched against.

provider from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider="..."). See [td_create] for a list of recognized providers.

version Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.

db a connection to the taxadb database. See details.

ignore_case should we ignore case (capitalization) in matching names? default is TRUE.

Examples

name_starts_with("Chera")

---

taxadb_dir  

Show the taxadb directory

Description

Show the taxadb directory

Usage

taxadb_dir()

Details

NOTE: after upgrading duckdb, a user may need to delete any existing databases created with the previous version. An efficient way to do so is unlink(taxadb::taxadb_dir(), TRUE).
Examples

## show the directory
taxadb_dir()
## Purge the local db
unlink(taxadb::taxadb_dir(), TRUE)

taxa_tbl

Return a reference to a given table in the taxadb database

Description

Return a reference to a given table in the taxadb database

Usage

taxa_tbl(
  provider = getOption("taxadb_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  db = td_connect()
)

Arguments

provider from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using options(default_taxadb_provider=...). See [td_create] for a list of recognized providers.
schema One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version Which version of the taxadb provider database should we use? defaults to latest. See [tl_import] for details.
db a connection to the taxadb database. See details.

Examples

## default schema is the dwc table
taxa_tbl()

## common names table
taxa_tbl(schema = "common")
Connect to the taxadb database

Usage

```r
td_connect(
  dbdir = taxadb_dir(),
  driver = Sys.getenv("TAXADB_DRIVER", "duckdb"),
  read_only = FALSE
)
```

Arguments

- **dbdir**: Path to the database.
- **driver**: Default driver, one of "duckdb", "MonetDBLite", "RSQlite". taxadb will select the first one of those it finds available if a driver is not set. This fallback can be overwritten either by explicit argument or by setting the environmental variable TAXADB_DRIVER.
- **read_only**: logical, should the database be opened read_only? Prevents importing but will allow concurrent access from multiple sessions.

Details

This function provides a default database connection for taxadb. Note that you can use taxadb with any DBI-compatible database connection by passing the connection object directly to taxadb functions using the db argument. td_connect() exists only to provide reasonable automatic defaults based on what is available on your system.

duckdb or MonetDBLite will give the best performance, and regular users taxadb will work with the built-in RSQlite, and with other database connections such as Postgres or MariaDB, but queries (filtering joins) will be much slower on these non-columnar databases.

For performance reasons, this function will also cache and restore the existing database connection, making repeated calls to td_connect() much faster and more failsafe than repeated calls to DBI::dbConnect

Value

Returns a DBI connection to the default duckdb database
td_create

create a local taxonomic database

Description

create a local taxonomic database

Usage

td_create(
  provider = getOption("taxadb_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  overwrite = TRUE,
  lines = 1e+05,
  dbdir = taxadb_dir(),
  db = td_connect(dbdir)
)

Arguments

provider
  a list (character vector) of provider to be included in the database. By default, will install itis. See details for a list of recognized provider. Use provider="all" to install all available provider automatically.
schema
  One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
version
  Which version of the taxadb provider database should we use? defaults to latest. See tl_import for details.
overwrite
  Should we overwrite existing tables? Default is TRUE. Change to "ask" for interactive interface, or TRUE to force overwrite (i.e. updating a local database upon new release.)
lines
  number of lines that can be safely read in to memory at once. Leave at default or increase for faster importing if you have plenty of spare RAM.
dbdir
  a location on your computer where the database should be installed. Defaults to user data directory given by [rappdirs::user_data_dir].
db
  connection to a database. By default, taxadb will set up its own fast database connection.

Examples

## OPTIONAL: you can first set an alternative home location, such as a temporary directory:
Sys.setenv(TAXADB_HOME=file.path(tempdir(), "taxadb"))

## Connect to the database:
db <- td_connect()
Details

Authorities currently recognized by taxadb are:

- **tpl**: The Plant List, http://www.theplantlist.org/
- **gbif**: Global Biodiversity Information Facility, https://www.gbif.org/
- **fb**: FishBase, https://www.fishbase.de/
- **slb**: SeaLifeBase, http://sealifebase.org
- **wd**: Wikidata: https://www.wikidata.org
- **ott**: OpenTree Taxonomy: https://github.com/OpenTreeOfLife/reference-taxonomy
- **iucn**: IUCN Red List, https://iucnredlist.org
- **itis_test**: a small subset of ITIS, cached locally with the package for testing purposes only

Value

path where database has been installed (invisibly)

Examples

```r
## Install the ITIS database
td_create()

## force re-install:
td_create( overwrite = TRUE)
```

disconnect

Disconnect from the taxadb database.

Description

Disconnect from the taxadb database.

Usage

```r
td_disconnect(db = td_connect())
```

Arguments

- **db** database connection
Details

This function manually closes a connection to the taxadb database.

Examples

```r
td_disconnect()
```

---

tl_import

Import taxonomic database tables

Description

Downloads the requested taxonomic data tables and return a local path to the data in tsv.gz format. Downloads are cached and identified by content hash so that `tl_import` will not attempt to download the same file multiple times.

Usage

```r
tl_import(
  provider = getOption("tl_default_provider", "itis"),
  schema = c("dwc", "common"),
  version = latest_version(),
  prov = paste0("https://raw.githubusercontent.com/",
                 "boettiger-lab/taxadb-cache/master/prov.json")
)
```

Arguments

- `provider`: from which provider should the hierarchy be returned? Default is 'itis', which can also be configured using `options(default_taxadb_provider=...)`. See [td_create] for a list of recognized providers.
- `schema`: One of "dwc" (for Darwin Core data) or "common" (for the Common names table.)
- `version`: Which version of the taxadb provider database should we use? defaults to latest. See `tl_import` for details.
- `prov`: Address (URL) to provenance record

Details

`tli` imports parses a DCAT2/PROV-O record to determine the correct version to download. If offline, `tl_import` will attempt to resolve against it's own provenance cache. Users can also examine / parse the prov JSON-LD file directly to determine the provenance of the data products used.
$tl\_import$ 23

**Value**

path(s) to the downloaded files in the cache
Index

*filter_by
  filter_by, 5
  filter_common, 6
  filter_id, 7
  filter_name, 9
  filter_rank, 10

*get
  get_ids, 12
  get_names, 14

clean_names, 2
common_contains, 3
common_starts_with, 4

DBI::dbConnect, 19
DBI::dbFetch(), 15
dplyr::mutate(), 15
dplyr::tbl, 15

filter_by, 5, 7, 8, 10, 11
filter_common, 6, 6, 8, 10, 11
filter_id, 6, 7, 7, 10, 11
filter_id(), 13
filter_name, 6–8, 9, 11
filter_rank, 6–8, 10, 10
fuzzy_filter, 11

get_ids, 12, 15
get_names, 13, 14

mutate_db, 15

NA, 13, 15
name_contains, 16
name_starts_with, 16

stringi::stri_trans_general(), 3

taxa_tbl, 18
taxadb_dir, 17
td_connect, 19

td_create, 20
tdDisconnect, 21
tl_import, 4, 5, 7–10, 12, 16–18, 20, 22, 22
TRUE, 3