

Package ‘taxify’

July 23, 2026

Title Offline Taxonomic Name Matching Against Darwin Core Backbones

Version 0.4.0

Description Match taxonomic names against locally stored Darwin Core backbone databases ('WFO', 'COL', 'GBIF', 'ITIS', 'NCBI Taxonomy', 'Open Tree of Life', 'WoRMS', 'Euro+Med', 'Species Fungorum', 'AlgaeBase', 'FishBase', 'SeaLifeBase', 'Reptile Database', 'LCVP', 'WCVP'). Provides offline fuzzy and exact matching with synonym resolution, hybrid name detection, and a unified output schema across all sources. All heavy computation runs in the 'vectra' C11 columnar engine.

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URL <https://gillescolling.com/taxify/>,
<https://github.com/gcol33/taxify>

BugReports <https://github.com/gcol33/taxify/issues>

Additional_repositories <https://gcol33.r-universe.dev>

Depends R (>= 4.1.0)

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add_algae_traits	Add macroalgal functional traits (AlgaeTraits)
------------------	--

Description

Joins AlgaeTraits (Vranken et al. 2023) macroalgal functional traits to a `taxify()` result by looking up `accepted_name`. AlgaeTraits provides morphological, ecological, and life-history traits for European seaweeds.

Usage

```
add_algae_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: AlgaeTraits (Vranken et al. 2023, VLIZ Marine Data Archive, CC BY 4.0). Coverage: ~1,745 European macroalgae species.

Value

The same data.frame with additional columns:

- algae_body_size_cm** Maximum body size in centimetres.
- algae_growth_form** Growth form / body shape (e.g., filamentous, foliose, crustose).
- algae_calcification** Calcification type (e.g., uncalcified, articulated, encrusting).
- algae_life_span** Life span category (annual, perennial, etc.).
- algae_tidal_zone** Tidal zonation (e.g., supralittoral, eulittoral, sublittoral).
- algae_wave_exposure** Wave exposure tolerance (sheltered, moderately exposed, exposed).
- algae_environment** Habitat environment (marine, brackish, freshwater).
- algae_substrate** Environmental position / substrate type.

References

Vranken S et al. (2023) AlgaeTraits: a trait database for (European) seaweeds. Earth System Science Data 15:2711-2754. doi:10.5194/essd-15-2711-2023

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Fucus vesiculosus", backbone = "gbif") |>
  add_algae_traits()

options(old)
```

```
add_alien_first_records
```

Add alien species first record years

Description

Joins alien species first record data to a `taxify()` result, filtered by country. Data from the Global Alien Species First Record Database (Seebens et al. 2017).

Usage

```
add_alien_first_records(x, country, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>country</code>	Character. ISO 3166-1 alpha-2 country code(s), or "all". • Single code (e.g., "AT"): adds columns without suffix. • Multiple codes (e.g., c("AT", "DE")): adds columns with country suffix (e.g., <code>alien_first_record_AT</code>). • "all": adds one column set per country in the dataset.
<code>cols</code>	List the country codes covered with <code>enrichment_groups("alien_first_records")</code> . Character vector of value columns to attach (from <code>alien_first_record</code> , <code>alien_first_record_source</code> , <code>alien_first_record_reference</code>), or "all". NULL (default) attaches all three.
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Global Alien Species First Record Database v3.1 (Seebens et al. 2017, Nature Communications 8, 14435). CC BY 4.0. Coverage: ~77k species x country combinations across all taxa.

Value

The same data.frame with additional column(s):

alien_first_record Year of the first record (integer), or NA if not recorded for that country.

alien_first_record_source Database that contributed the record (e.g., "GAVIA", "CABI ISC").

alien_first_record_reference Original citation or reference for the record.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Robinia pseudoacacia") |>
  add_alien_first_records(country = "AT")

taxify(c("Robinia pseudoacacia", "Ailanthus altissima")) |>
  add_alien_first_records(country = c("AT", "DE"))

options(old)
```

add_amniote	<i>Add amniote life-history traits (Amniote Life History Database)</i>
-------------	--

Description

Joins uniform life-history traits for birds, mammals and reptiles to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_amniote(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Amniote Life History Database (Myhrvold et al. 2015, Ecology, CC0). Coverage: 21,322 species across birds, mammals and reptiles.

Value

The same data.frame with additional columns:

amniote_class Taxonomic class (Aves/Mammalia/Reptilia).
amniote_adult_body_mass_g Adult body mass (g).
amniote_no_sex_body_mass_g Unsexed adult body mass (g).
amniote_female_body_mass_g Female body mass (g).
amniote_male_body_mass_g Male body mass (g).

amniote_adult_svl_cm Adult snout-vent length (cm).
amniote_maximum_longevity_y Maximum longevity (years).
amniote_litter_clutch_size Litter or clutch size (count).
amniote_clutches_per_y Litters or clutches per year (count).
amniote_egg_mass_g Egg mass (g).
amniote_incubation_d Incubation period (days).
amniote_female_maturity_d Age at female maturity (days).
amniote_gestation_d Gestation length (days).
amniote_weaning_d Weaning age (days).
amniote_birth_hatching_wt_g Birth or hatching weight (g).

References

Myhrvold NP et al. (2015) An amniote life-history database to perform comparative analyses with birds, mammals, and reptiles. *Ecology* 96:3109. doi:[10.1890/150846R.1](https://doi.org/10.1890/150846R.1)

Examples

```
## Not run:
taxify("Accipiter badius", backbone = "gbif") |>
  add_amniote()

## End(Not run)
```

add_amphibio	<i>Add amphibian life-history traits (AmphiBIO)</i>
--------------	---

Description

Joins AmphiBIO amphibian life-history and ecological traits to a `taxify()` result by looking up accepted_name.

Usage

```
add_amphibio(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: AmphiBIO (Oliveira et al. 2017, CC BY 4.0). Coverage: ~6,800 amphibian species. Amphibians only.

Value

The same data.frame with additional columns:

body_size_mm Maximum body size in mm (snout-vent length).

age_maturity_y Age at maturity in years.

longevity_yr Maximum longevity in years.

litter_size Clutch/litter size.

reproductive_output Reproductive output per year.

offspring_size_mm Offspring size in mm.

direct_development Direct development (0/1).

larval Has larval stage (0/1).

aquatic Aquatic habitat (0/1).

fossorial Fossorial habitat (0/1).

arboreal Arboreal habitat (0/1).

diurnal Diurnal activity (0/1).

nocturnal_amphibio Nocturnal activity (0/1). Named nocturnal_amphibio to avoid collision with EltonTraits' nocturnal column.

References

Oliveira BF, Sao-Pedro VA, Santos-Barrera G, Penone C, Costa GC (2017) AmphiBIO, a global database for amphibian ecological traits. Scientific Data 4:170123.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Bufo bufo", backbone = "gbif") |>
  add_amphibio()

options(old)
```

add_anage	<i>Add longevity and life-history traits (AnAge)</i>
-----------	--

Description

Joins AnAge (Animal Ageing and Longevity Database) traits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_anage(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: AnAge (de Magalhaes & Costa 2009, CC BY). Coverage: ~4.7k vertebrate species (mammals, birds, reptiles, amphibians, fish).

Value

The same data.frame with additional columns:

max_longevity_yr Maximum longevity in years.
anage_body_mass_g Adult body mass in grams.
metabolic_rate_w Basal metabolic rate in watts.
female_maturity_d Female age at sexual maturity in days.
male_maturity_d Male age at sexual maturity in days.
gestation_incubation_d Gestation or incubation length in days.
anage_litter_size Litter or clutch size.
birth_mass_g Mass at birth in grams.
growth_rate Growth rate (1/days).
temperature_k Body temperature in Kelvin.

References

de Magalhaes JP, Costa J (2009) A database of vertebrate longevity records and their relation to other life-history traits. *Journal of Evolutionary Biology* 22:1770-1774.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Vulpes vulpes", backbone = "gbif") |>
  add_anage()

options(old)
```

add_animaltraits	<i>Add cross-taxon body mass and metabolic rate (AnimalTraits)</i>
------------------	--

Description

Joins AnimalTraits body mass and metabolic rate data to a `taxify()` result by looking up `accepted_name`.

Usage

```
add_animaltraits(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: AnimalTraits (Hebert et al. 2022, CC0). Coverage: ~2k species across arthropods, vertebrates, molluscs, and annelids. Individual-level observations aggregated to species medians.

Value

The same data.frame with additional columns:

animaltraits_body_mass_kg Median body mass in kg.

animaltraits_metabolic_rate_w Median metabolic rate in watts.

References

Hebert K et al. (2022) AnimalTraits – a curated animal trait database for body mass, metabolic rate and brain size. *Scientific Data* 9:265.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Drosophila melanogaster", backbone = "gbif") |>
  add_animaltraits()

options(old)
```

add_arctic_traits	<i>Add Arctic marine benthos traits</i>
-------------------	---

Description

Joins Arctic Traits Database functional traits to a `taxify()` result by `accepted_name`. Each fuzzy-coded trait is reduced to its dominant category.

Usage

```
add_arctic_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Arctic Traits Database (Degen & Faulwetter 2019, University of Vienna PHAIDRA, CC-BY 4.0).

Value

The same data.frame with categorical `arctic_traits_columns`: `feeding_habit`, `skeleton`, `reproduction`, `larval_development`, `size`, `living_habit`, `body_form`, `mobility`, `bioturbation`, `depth_range`, `trophic_level`, `fragility`, `sociability`, `longevity`.

References

Degen R, Faulwetter S (2019) The Arctic Traits Database. University of Vienna. doi:10.25365/phaidra.49

Examples

```
## Not run:
taxify("Astarte borealis", backbone = "gbif") |>
  add_arctic_traits()

## End(Not run)
```

add_arthropod_traits *Add arthropod life-history traits (NW European Arthropods)*

Description

Joins the Northwestern European Arthropod Life Histories dataset to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_arthropod_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Logghe et al. (2025, CC BY-NC). Coverage: ~4.9k arthropod species from NW Europe across 10 orders (Coleoptera, Hemiptera, Orthoptera, Araneae, Diptera, Hymenoptera, Lepidoptera, etc.).

Value

The same data.frame with additional columns:

arthropod_body_size_mm Body size in mm.
arthropod_dispersal Dispersal ability (0–1 ratio within order).
arthropod_voltinism Mean number of generations per year.
arthropod_fecundity Fecundity (number of eggs/offspring).
arthropod_development_d Development time in days.
arthropod_lifespan_d Adult lifespan in days.
arthropod_thermal_mean Mean thermal niche (degrees C).
arthropod_diurnality Activity period (diurnal/nocturnal/both).
arthropod_feeding_guild Feeding guild of adult.
arthropod_trophic_range Trophic range of adult (specialist/generalist).

References

Logghe A et al. (2025) An in-depth dataset of northwestern European arthropod life histories and ecological traits. Biodiversity Data Journal 13:e146785.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Abax parallelepipedus", backbone = "gbif") |>
  add_arthropod_traits()

options(old)
```

add_austraits	<i>Add Australian plant traits (AusTraits)</i>
---------------	--

Description

Joins species-level plant functional traits to a [taxify\(\)](#) result by looking up accepted_name. Values are aggregated from the long-format AusTraits database (numeric traits by median, categorical traits by mode).

Usage

```
add_austraits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: AusTraits (Falster et al. 2021, Scientific Data, CC BY 4.0). Coverage: ~33k Australian plant taxa.

Value

The same data.frame with additional columns:

austraits_plant_growth_form Plant growth form.
austraits_life_history Life history (annual/perennial/...).
austraits_woodiness Woodiness.

austraits_photosynthetic_pathway Photosynthetic pathway (C3/C4/CAM).

austraits_dispersal_syndrome Dispersal syndrome.

austraits_resprouting_capacity Resprouting capacity (fire response).

austraits_flowering_time Flowering time.

austraits_plant_height_m Plant height (m).

austraits_leaf_length_mm Leaf length (mm).

austraits_leaf_width_mm Leaf width (mm).

austraits_leaf_area_mm2 Leaf area (mm2).

austraits_leaf_mass_per_area Leaf mass per area (g/m2; SLA is its reciprocal).

austraits_leaf_n_per_dry_mass Leaf nitrogen per dry mass (mg/g).

austraits_leaf_p_per_dry_mass Leaf phosphorus per dry mass (mg/g).

austraits_seed_dry_mass_mg Seed dry mass (mg).

austraits_wood_density_g_cm3 Wood density (g/cm3).

References

Falster D et al. (2021) AusTraits, a curated plant trait database for the Australian flora. Scientific Data 8:254. doi:[10.1038/s41597021010066](https://doi.org/10.1038/s41597021010066)

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

taxify("Eucalyptus globulus", backbone = "gbif") |>
  add_austraits()

options(old)
```

add_avonet

Add bird morphology and migration (AVONET)

Description

Joins AVONET species-level averages for bird morphology, ecology, and migration to a `taxify()` result by looking up `accepted_name`.

Usage

```
add_avonet(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach. NULL (the default) attaches the curated set; a character vector of column names attaches just those, and "all" attaches every column the source carries (see <code>enrichment_cols()</code>).
<code>verbose</code>	Logical. Default TRUE.

Details

Source: AVONET (Tobias et al. 2022, Figshare, CC BY 4.0). Coverage: ~11k bird species. Birds only.

Value

The same data.frame with additional columns:

beak_length Beak length in mm (culmen, species mean).

beak_depth Beak depth in mm (species mean).

wing_length Wing length in mm (species mean).

tail_length Tail length in mm (species mean).

tarsus_length Tarsus length in mm (species mean).

avonet_body_mass_g Body mass in grams (species mean).

hand_wing_index Hand-wing index (pointedness, species mean).

habitat Primary habitat classification.

trophic_level Trophic level classification.

trophic_niche Trophic niche classification.

migration Migration strategy: "sedentary", "partial", or "full".

References

Tobias JA et al. (2022) AVONET: morphological, ecological and geographical data for all birds. Ecology Letters 25:581-597.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Parus major", backbone = "gbif") |>
  add_avonet()

options(old)
```

add_bacdiv

Add bacterial and archaeal strain phenotypes (BacDive)

Description

Joins per-species microbial phenotype and growth-condition traits from BacDive, the Bacterial Diversity Metadatabase (DSMZ), to a [taxify\(\)](#) result by looking up accepted_name. Strain-level records are aggregated to one row per species (categorical traits by mode, numeric by median); temperature and pH prefer the optimum measurement, falling back to the growth measurement.

Usage

```
add_bacdiv(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: BacDive (Reimer et al.), DSMZ, CC BY 4.0. ~18.6k bacterial and archaeal species with at least one phenotypic trait.

Value

The same data.frame with additional columns:

gram_stain Gram reaction (positive / negative / variable).

cell_shape Cell morphology (rod, coccus, ...).

motility motile / non-motile.

oxygen_metabolism Oxygen tolerance (aerobe, anaerobe, facultative anaerobe, microaerophile, ...).

cell_length_um, cell_width_um Cell dimensions in micrometres.

optimal_growth_temp_c Optimal (or reported growth) temperature, C.

optimal_growth_ph Optimal (or reported growth) pH.

References

Reimer LC et al. (2022) BacDive in 2022: the knowledge base for standardized bacterial and archaeal data. Nucleic Acids Research 50:D741-D746. doi:10.1093/nar/gkab961

Examples

```
## Not run:
taxify("Escherichia coli", backbone = "gbif") |>
  add_bacdiv()

## End(Not run)
```

add_baseflor	<i>Add plant traits from Baseflor (Catminat / Julve)</i>
--------------	--

Description

Joins Baseflor (Julve, Programme Catminat) plant traits to a [taxify\(\)](#) result by looking up accepted_name. Baseflor covers the vascular flora of France and neighbouring regions, providing flowering phenology, pollination and breeding biology, dispersal mode, and floral and fruit morphology.

Usage

```
add_baseflor(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Baseflor, Programme Catminat (Julve 1998 ff.). Coverage: ~7,000 vascular plant taxa of France and neighbouring regions. Data are released under ODbL 1.0 / CC BY-SA 2.0.

For ecological indicator values on the light, temperature, moisture, reaction, and nutrient axes, see [add_eive\(\)](#) (European calibration). For Raunkiaer life form and seed, leaf, and clonality traits of the Northwest European flora, see [add_leda\(\)](#).

Value

The same data.frame with additional columns:

flower_begin_month First month of flowering (1-12).

flower_end_month Last month of flowering (1-12). A value smaller than flower_begin_month denotes a flowering period that wraps across the new year (e.g. begin 10, end 6).

pollination_vector Pollination vector(s): insect, wind, water, self, apogamy. Comma-separated when more than one applies.

dispersal_mode Diaspore dispersal mode(s): anemochory, barochory, epizoochory, endozoochory, myrmecochory, hydrochory, autochory, dyszoochory. Comma-separated when more than one applies.

breeding_system Sexual system: hermaphroditic, monoecious, dioecious, gynodioecious, androdioecious, gynomonoeious, polygamous.

flower_colour Flower colour(s): white, yellow, pink, green, blue, brown, black. Comma-separated when more than one applies.

fruit_type Fruit type: achene, capsule, caryopsis, drupe, legume, silique, berry, follicle, cone, samara, pyxid.

woody_growth_form Woody growth form for woody taxa: tree, small tree, large tree, shrub, bush, subshrub, liana, parasite. NA for non-woody (herbaceous) taxa.

continentiality Ellenberg-style continentiality indicator value (1-9), the axis absent from EIVE.

salinity Ellenberg-style salinity indicator value (0-9), the axis absent from EIVE.

References

Julve, Ph. (1998 ff.) baseflor. Index botanique, écologique et chorologique de la Flore de France. Programme Catminat.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Bellis perennis") |>
  add_baseflor()

options(old)
```

add_bee_ostwald	<i>Add bee morphometrics (Ostwald)</i>
-----------------	--

Description

Joins global bee morphological traits to a `taxify()` result by `accepted_name`. Long-format measurements are reduced to species medians.

Usage

```
add_bee_ostwald(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Ostwald et al. global bee morphology (Zenodo, CC-BY 4.0).

Value

The same data.frame with numeric columns bee_ostwald_itd_mm (intertegular distance), bee_ostwald_forewing_length_mm, bee_ostwald_tongue_length_mm, bee_ostwald_tongue_width_mm, bee_ostwald_body_length_mm, bee_ostwald_thorax_length_mm, bee_ostwald_hair_length_mm, bee_ostwald_hair_coverage_pct.

References

Ostwald MM et al. (2024) A global database of bee morphological traits. Zenodo. [doi:10.5281/zenodo.13366989](https://doi.org/10.5281/zenodo.13366989)

Examples

```
## Not run:
taxify("Apis mellifera", backbone = "gbif") |>
  add_bee_ostwald()

## End(Not run)
```

add_bet	Add bryophyte traits (Bryophytes of Europe Traits)
---------	--

Description

Joins species-level bryophyte traits to a `taxify()` result by looking up accepted_name.

Usage

```
add_bet(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Bryophytes of Europe Traits (van Zuijlen et al. 2023, EnviDat, CC BY-SA 4.0). Coverage: ~1.8k bryophyte species.

Value

The same data.frame with additional columns:

bet_growth_form Growth form (acrocarpous/pleurocarpous/thalloid/...).

bet_life_form Life form (cushion/mat/turf/weft/...).

bet_life_strategy Life strategy (During).

bet_sexual_condition Sexual condition (monoicous/dioicous).

bet_shoot_size_mm Mean shoot size (mm).

bet_generation_length_y Generation length (years).

bet_spore_diameter_um Mean spore diameter (micrometres).

bet_ind_light Ellenberg light indicator value.

bet_ind_temperature Ellenberg temperature indicator value.

bet_ind_moisture Ellenberg moisture indicator value.

bet_ind_reaction_ph Ellenberg reaction (pH) indicator value.

bet_ind_nitrogen Ellenberg nitrogen indicator value.

bet_substrate_soil Occurs on soil (0/1).

bet_substrate_rock Occurs on rock (0/1).

bet_substrate_bark Occurs on bark (0/1).

bet_substrate_deadwood Occurs on deadwood (0/1).

bet_epiphyte Epiphytic (0/1).

bet_redlist_category IUCN European Red List category.

References

van Zuijlen K et al. (2023) Bryophytes of Europe Traits (BET): a fundamental dataset for European bryophyte ecology. EnviDat. doi:[10.16904/envi.dat.348](https://doi.org/10.16904/envi.dat.348)

Examples

```
## Not run:
taxify("Abietinella abietina", backbone = "gbif") |>
  add_bet()

## End(Not run)
```

add_beukhof	<i>Add marine fish traits (Beukhof)</i>
-------------	---

Description

Joins North Atlantic / NE Pacific shelf marine-fish life-history and ecology traits to a `taxify()` result by `accepted_name` (species-level summaries).

Usage

```
add_beukhof(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Beukhof et al. (2019) marine fish trait collection (PANGAEA, CC-BY 4.0).

Value

The same data.frame with beukhof_ columns: numeric `trophic_level`, `aspect_ratio`, `offspring_size`, `age_maturity`, `fecundity`, `length_infinity_cm`, `growth_coefficient`, `length_max_cm`; categorical `habitat`, `feeding_mode`, `body_shape`, `fin_shape`, `spawning_type`.

References

Beukhof E et al. (2019) A trait collection of marine fish species from North Atlantic and Northeast Pacific continental shelf seas. PANGAEA. doi:[10.1594/PANGAEA.900866](https://doi.org/10.1594/PANGAEA.900866)

Examples

```
## Not run:
taxify("Gadus morhua", backbone = "gbif") |>
  add_beukhof()

## End(Not run)
```

add_bien	<i>Add plant traits (BIEN)</i>
----------	--------------------------------

Description

Joins BIEN plant functional traits to a [taxify\(\)](#) result by looking up accepted_name. Values are species-level aggregates of public-access BIEN records (numeric by median, categorical by mode).

Usage

```
add_bien(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: BIEN (Botanical Information and Ecology Network; Maitner et al. 2018, Methods Ecol Evol, CC BY). Coverage: tens of thousands of vascular plant species.

Value

The same data.frame with additional columns:

bien_plant_height_m Whole-plant height (m).
bien_max_plant_height_m Maximum whole-plant height (m).
bien_dbh_cm Diameter at breast height (cm).
bien_sla_mm2_mg Leaf area per leaf dry mass (SLA).
bien_leaf_area_mm2 Leaf area.
bien_leaf_dry_mass_mg Leaf dry mass.
bien_leaf_n_per_dry_mass Leaf nitrogen per dry mass.
bien_leaf_p_per_dry_mass Leaf phosphorus per dry mass.
bien_leaf_thickness_mm Leaf thickness.
bien_seed_mass_mg Seed mass.
bien_wood_density_g_cm3 Stem wood density (g/cm3).
bien_leaf_lifespan Leaf life span.
bien_growth_form Whole-plant growth form.
bien_woodiness Whole-plant woodiness.
bien_dispersal_syndrome Whole-plant dispersal syndrome.
bien_flower_color Flower colour.

References

Maitner BS et al. (2018) The BIEN R package: A tool to access the Botanical Information and Ecology Network (BIEN) database. *Methods in Ecology and Evolution* 9:373-379. doi:10.1111/2041210X.12861

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus alba", backbone = "gbif") |>
  add_bien()

options(old)
```

add_birdbase	<i>Add bird traits (BIRDBASE)</i>
--------------	-----------------------------------

Description

Joins BIRDBASE biogeography, conservation and life-history traits to a `taxify()` result by looking up accepted_name. Traits redundant with `add_avonet()` morphology are not carried.

Usage

```
add_birdbase(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: BIRDBASE (Sekercioglu et al. 2025, figshare, CC BY 4.0). Coverage: ~11.6k bird species.

Value

The same data.frame with additional columns:

birdbase_iucn_status IUCN Red List category.

birdbase_realm Biogeographic realm.

birdbase_latitudinal_zone Latitudinal zone (1 tropical to 5).

birdbase_island_endemic Island-restricted breeding (0/1).

birdbase_restricted_range Restricted-range species (0/1).
birdbase_elevation_min_m Lower elevation limit (m).
birdbase_elevation_max_m Upper elevation limit (m).
birdbase_elevation_range_m Elevational breadth (m).
birdbase_primary_habitat Primary habitat.
birdbase_habitat_breadth Habitat breadth (number of habitats).
birdbase_primary_diet Primary diet.
birdbase_diet_breadth Diet breadth (number of food types).
birdbase_specialization_esi Ecological specialization index.
birdbase_clutch_min Minimum clutch size (eggs).
birdbase_clutch_max Maximum clutch size (eggs).
birdbase_nest_type Nest architecture.
birdbase_flightlessness Volancy (yes/no/partial).

References

Sekercioglu CH et al. (2025) BIRDBASE: a global database of bird ecological and life-history traits. Scientific Data. [doi:10.1038/s41597025056153](https://doi.org/10.1038/s41597025056153)

Examples

```
## Not run:
taxify("Struthio camelus", backbone = "gbif") |>
  add_birdbase()

## End(Not run)
```

add_blanchard	<i>Add ant genus defensive traits (Blanchard & Moreau)</i>
---------------	--

Description

Joins genus-level ant defensive and ecological traits to a `taxify()` result by genus.

Usage

```
add_blanchard(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Blanchard & Moreau (2017) ant defensive traits (Dryad, CC0). Joins on genus because the database is genus-resolved.

Value

The same data.frame with blanchard_ columns: categorical subfamily, spines, sting, diet, nesting, foraging; numeric colony_size_workers (joined on genus).

References

Blanchard BD, Moreau CS (2017) Defensive traits in the ant genera database. Dryad. [doi:10.5061/dryad.st6sc](https://doi.org/10.5061/dryad.st6sc)

Examples

```
## Not run:
taxify("Camponotus pennsylvanicus", backbone = "gbif") |>
  add_blanchard()

## End(Not run)
```

add_brot

Add Mediterranean plant traits (BROT 2.0)

Description

Joins Mediterranean-Basin plant fire-response, regeneration and functional traits to a [taxify\(\)](#) result by accepted_name.

Usage

```
add_brot(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: BROT 2.0 (Tavsanoglu & Pausas 2018, Scientific Data, CC-BY 4.0).

Value

The same data.frame with brot_ columns: numeric seed_mass_mg, sla_mm2_mg, height_m, leaf_area_mm2; categorical resp_fire, growth_form, disp_mode, fruit_type, soil_seed_bank, seedling_emergence.

References

Tavsanoglu C, Pausas JG (2018) A functional trait database for Mediterranean Basin plants (BROT 2.0). Scientific Data 5:180135. doi:10.6084/m9.figshare.c.3843841

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus coccifera", backbone = "gbif") |>
  add_brot()

options(old)
```

add_bryoatt

Add British and Irish bryophyte attributes (BRYOATT)

Description

Joins attributes of British and Irish mosses, liverworts and hornworts (Hill et al. 2007) to a [taxify\(\)](#) result by looking up accepted_name. Bryophytes are otherwise almost absent from the bundled trait databases.

Usage

```
add_bryoatt(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

1,194 taxa. The vascular-plant companion is [add_plantatt\(\)](#).

This source states no licence (it is copyright the Biological Records Centre), so taxify ships no pre-built copy of it. The first call builds it from the original source on your own machine, which requires the taxifydb package (remotes::install_github("gcol33/taxifydb")). taxify redistributes none of the data. Cite Hill et al. (2007) when you use it.

Value

The same data.frame with additional columns. The default set:

bryoatt_ellenberg_light, **bryoatt_ellenberg_moisture**, **bryoatt_ellenberg_reaction**, **bryoatt_ellenberg_nitrogen**, **bryoatt_ellenberg_phosphorus** Ellenberg indicator values calibrated for British and Irish bryophytes.

bryoatt_life_form Life-form code, kept verbatim (Ts, Mr, Ms, ...).

bryoatt_plant_group Plant group: M moss, L liverwort, H hornwort.

bryoatt_status Status code, kept verbatim (N native, AN alien naturalised, AR archaeophyte).

References

Hill MO, Preston CD, Bosanquet SDS, Roy DB (2007) BRYOATT: Attributes of British and Irish Mosses, Liverworts and Hornworts. NERC Centre for Ecology and Hydrology.

Examples

```
## Not run:
# Builds the enrichment on first use (needs taxifydb).
taxify("Polytrichum commune", backbone = "gbif") |>
  add_bryoatt()

## End(Not run)
```

add_ccdb

Add plant chromosome numbers (Chromosome Counts Database)

Description

Joins somatic chromosome numbers from the Chromosome Counts Database (Rice et al. 2015) to a [taxify\(\)](#) result by looking up accepted_name. CCDB aggregates published counts per taxon; records are collapsed to the binomial and reduced to a per-species median with its observed range.

Usage

```
add_ccdb(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: CCDB (ccdb.tau.ac.il), citation requested, no explicit licence, so taxify publishes no pre-built copy. The data is built on your machine from the original source, which needs taxifydb installed: `remotes::install_github("gcol33/taxifydb")`.

CCDB's service reports gametic numbers, which taxifydb doubles to the somatic 2n reported here. The spread between min and max is real ploidy variation among a species' cytotypes rather than measurement error, so a polyploid complex legitimately spans a wide range (*Sedum acre* runs 2n = 40 to 120). Where a species is covered by both, this and the CC BY `add_kew_cvalues()` chromosome column agree exactly for 85% of the 7133 species they share; the rest are compilations differing over which cytotype is typical.

Value

The same data.frame with additional columns. The default set:

ccdb_chromosome_2n Median somatic chromosome number (2n).

ccdb_chromosome_2n_min Lowest 2n reported for the species.

ccdb_chromosome_2n_max Highest 2n reported for the species.

References

Rice A, Glick L, Abadi S, Einhorn M, Kopelman NM, Salman-Minkov A, Mayzel J, Chay O, Mayrose I (2015) The Chromosome Counts Database (CCDB) - a community resource of plant chromosome numbers. *New Phytologist* 206:19-26.

See Also

`add_kew_cvalues()` for genome size and a CC BY chromosome number.

Examples

```
## Not run:
# Builds the enrichment on first use (requires taxifydb).
taxify("Zea mays", backbone = "gbif") |>
  add_ccdb()

## End(Not run)
```

add_cefas_btrait	<i>Add benthic invertebrate traits (Cefas)</i>
------------------	--

Description

Joins biological traits of North-West European continental-shelf benthic macrofauna from the Cefas biological-traits database to a `taxify()` result by looking up genus. The source fuzzy-codes traits at genus level, and each trait is reduced to its highest-scoring modality, so the join is on genus rather than `accepted_name`: every species in a coded genus is annotated.

Usage

```
add_cefas_btrait(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: North-West European continental-shelf benthos biological-traits database, Cefas Data Hub ([doi:10.14466/CefasDataHub.123](https://doi.org/10.14466/CefasDataHub.123)), Open Government Licence v3.0.

Value

The same data.frame with additional columns. The default set:

cefas_body_size Maximum body-size class.

cefas_morphology Body morphology.

cefas_lifespan Life-span class.

cefas_living_habit Living habit.

cefas_feeding_mode Feeding mode.

cefas_mobility Mobility.

cefas_bioturbation Bioturbation mode.

`cols = "all"` also attaches egg and larval development and sediment position.

References

Centre for Environment, Fisheries and Aquaculture Science (2022) North-West European continental-shelf benthos biological-traits database. [doi:10.14466/CefasDataHub.123](https://doi.org/10.14466/CefasDataHub.123)

Examples

```
## Not run:
# Downloads the enrichment on first use.
taxify("Abra alba", backbone = "gbif") |>
  add_cefas_btrait()

## End(Not run)
```

add_chelonians	<i>Add turtle traits (CheloniansTraits)</i>
----------------	---

Description

Joins species-level turtle and tortoise traits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_chelonians(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: CheloniansTraits (Wang et al. 2025, figshare, CC BY 4.0). Coverage: 358 turtle and tortoise species. Numeric values reported as "min-max" ranges in the source are reduced to their midpoint.

Value

The same data.frame with additional columns:

chelonian_carapace_length_mm Maximum straight-line carapace length (mm).

chelonian_max_mass_g Maximum body mass (g).

chelonian_clutch_size_mean Mean clutch size (count).

chelonian_clutch_size_max Maximum clutch size (count).

chelonian_clutches_per_year Clutches per year (count).

chelonian_incubation_d Incubation period (days).

chelonian_age_maturity_y Age at sexual maturity (years).

chelonian_max_lifespan_y Maximum lifespan (years).

chelonian_range_size_km2 Range size (km2).

chelonian_diet Diet (herbivorous/carnivorous/omnivorous).

chelonian_activity_time Activity time.

chelonian_microhabitat Microhabitat (aquatic/terrestrial/...).

chelonian_habitat_type Habitat type.

chelonian_shell_type Shell type (hardshell/softshell).

References

Wang Y et al. (2025) CheloniansTraits: a comprehensive trait database of global turtles and tortoises. figshare. doi:10.6084/m9.figshare.28828241

Examples

```
## Not run:
taxify("Chelonia mydas", backbone = "gbif") |>
  add_chelonians()

## End(Not run)
```

add_classification	<i>Add the full higher classification to a taxify result</i>
--------------------	--

Description

Attaches the Linnaean ranks above family (kingdom, phylum, class, order) to a `taxify()` result by joining each matched row back to its backbone. The core `taxify()` output already carries family and genus; this fills the ranks above them, for whichever ranks the matched backbone stores. Rows matched by different backbones are each joined against their own backbone.

Usage

```
add_classification(
  x,
  ranks = c("kingdom", "phylum", "class", "order"),
  verbose = TRUE
)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
ranks	Character vector of ranks to attach. Default <code>c("kingdom", "phylum", "class", "order")</code> .
verbose	Logical. Default TRUE.

Value

x with the requested rank columns added. A rank a backbone does not store is left NA (WFO, for example, carries no ranks above family).

See Also

`add_col_info()`, `add_gbif_info()` for backbone-specific extras.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Naja naja", backbone = "reptiledb") |>
  add_classification()

options(old)
```

add_clopla

Add clonal and bud-bank traits (CLO-PLA)

Description

Joins clonal growth, bud-bank and lifespan traits of the Central European flora (Klimesova et al. 2017) to a `taxify()` result by looking up `accepted_name`. Source records are collapsed to the binomial, so infraspecific rows are aggregated to the species (numeric traits by median, nominal traits by mode).

Usage

```
add_clopla(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every trait the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

2,909 species of the Central European flora.

This source states no licence – it is an Ecological Society of America data paper, free to use with citation – so `taxify` ships no pre-built copy of it. The first call builds it from the original source on your own machine, which requires the `taxifydb` package (`remotes::install_github("gcol33/taxifydb")`). `taxify` redistributes none of the data. Cite Klimesova et al. (2017) when you use it.

Value

The same data.frame with additional columns. The default set:

clopla_clonal Clonal growth present.

clopla_clonalindex Clonal index.

clopla_woody, **clopla_annual**, **clopla_monocarpic**, **clopla_polycarpic** Growth-form and life-cycle flags.

clopla_persistence Persistence of the clonal connection.

clopla_offspring Offspring produced per parent shoot per year.

clopla_spread Lateral spread.

clopla_BBsize, clopla_BBdepth Bud-bank size and depth.

clopla_finalCGO Final clonal growth organ.

cols = "all" attaches every trait the source carries (29 in total: the remaining bud-bank counts by depth class, root-derived bud banks, branching, cyclicity and dispersibility), with codes kept verbatim.

References

Klimesova J, Danihelka J, Chrtek J, de Bello F, Herben T (2017) CLO-PLA: a database of clonal and bud-bank traits of the Central European flora. Ecology 98:1179. doi:10.1002/ecy.1745

Examples

```
## Not run:
# Builds the enrichment on first use (needs taxifydb).
taxify("Trifolium repens", backbone = "gbif") |>
  add_clopla()

## End(Not run)
```

add_col_info	<i>Add COL-specific columns</i>
--------------	---------------------------------

Description

Joins extra Catalogue of Life columns to a `taxify()` result by looking up `taxon_id` in the COL backbone. Only enriches rows where `backbone == "col"`.

Usage

```
add_col_info(x)
```

Arguments

x A data.frame returned by `taxify()` with `backbone == "col"`.

Value

The same data.frame with additional columns:

notho Hybrid type from COL: "generic", "specific", "infrageneric", or "intraspecific".

nomenclaturalCode Nomenclatural code ("ICN", "ICZN", etc.).

nomenclaturalStatus Nomenclatural status.

namePublishedIn Original publication reference.

kingdom Kingdom classification.

phylum Phylum classification.

col_class Class classification (renamed to avoid conflict with R's class function).

order Order classification.

intraspecificEpithet Intraspecific epithet.

is_extinct Logical. Whether the species is extinct (from SpeciesProfile, if available).

is_marine Logical. Whether the species is marine.

is_freshwater Logical. Whether the species is freshwater.

is_terrestrial Logical. Whether the species is terrestrial.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur", backbone = "col") |>
  add_col_info()

options(old)
```

add_combine

Add mammal traits (COMBINE)

Description

The default COMBINE door. Attaches the reported (measured or literature compiled) trait values and fills each still-missing cell from COMBINE's phylogenetically imputed table, so a single call reaches the fullest coverage COMBINE offers. A measurement is never overwritten: the reported value wins wherever it exists and the imputed model only fills gaps. Beside every trait sits a <trait>_src column recording where that cell came from – "reported", "imputed", or NA when neither table has it – so a model estimate is always distinguishable from a measurement.

Usage

```
add_combine(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

For a single-table view use [add_combine_reported\(\)](#) (measured values only) or [add_combine_imputed\(\)](#) (the imputed table on its own).

Value

The same data.frame with the combine_* trait columns (reported values, gaps filled from the imputed table) and, beside each, a combine_*_src column tagging that cell as "reported", "imputed", or NA. Traits COMBINE does not impute (for example combine_biogeographical_realm) come out "reported" wherever present. If the imputed table is unavailable, the reported values are returned with every _src tag "reported" or NA.

See Also

[add_combine_reported\(\)](#), [add_combine_imputed\(\)](#)

Examples

```
## Not run:
# Coverage-filled values with per-trait provenance:
res <- taxify("Osphranter rufus", backbone = "col") |>
  add_combine()
res[, c("combine_gestation_length_d", "combine_gestation_length_d_src")]

## End(Not run)
```

add_combine_imputed	<i>Add mammal traits from COMBINE (phylogenetically imputed values)</i>
---------------------	---

Description

Joins the phylogenetically imputed COMBINE table to a [taxify\(\)](#) result by looking up accepted_name. This is the companion to [add_combine_reported\(\)](#): the same ~6.2k mammal species, but with the cells the reported table leaves missing filled in by COMBINE's phylogenetic multiple-imputation model, giving near-complete coverage for the life-history traits. Imputed values are model estimates, not measurements, so they are attached under their own combine_imputed_* columns rather than replacing the reported values.

Usage

```
add_combine_imputed(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: COMBINE (Soria et al. 2021, Ecology, CC0), imputed table (trait_data_imputed.csv). Same species set and column meanings as [add_combine_reported\(\)](#); the difference is coverage. Because imputation only fills gaps, applying both `doors` and comparing `combine_*` with `combine_imputed_*` shows which values are measured versus estimated.

Value

The same data.frame with additional columns, mirroring [add_combine_reported\(\)](#) but named `combine_imputed_*` (e.g. `combine_imputed_adult_mass_g`, `combine_imputed_gestation_length_d`). Traits COMBINE does not impute (for example `biogeographical_realm` and `habitat_breadth_n`) carry the reported coverage; the life-history traits (gestation, weaning, longevity, litter size, generation length, ...) are near-complete.

References

Soria CD et al. (2021) COMBINE: a coalesced mammal database of intrinsic and extrinsic traits. Ecology 102:e03344. [doi:10.1002/ecy.3344](https://doi.org/10.1002/ecy.3344)

See Also

[add_combine_reported\(\)](#) for the measured values; [add_combine\(\)](#) for the two coalesced with per-trait provenance.

Examples

```
## Not run:
# Compare reported vs imputed gestation length for a mammal:
taxify("Vulpes vulpes", backbone = "gbif") |>
  add_combine_reported() |>
  add_combine_imputed()

## End(Not run)
```

add_combine_reported *Add mammal traits from COMBINE (reported values)*

Description

Joins the COMBINE mammal trait database to a `taxify()` result by looking up accepted_name, attaching the **reported** (directly measured or literature-compiled) trait values. COMBINE ships two parallel tables over the same ~6.2k mammal species: the reported table used here, and a phylogenetically imputed table with the missing cells filled in by a model (`add_combine_imputed()`). They are offered as two separate sources so the distinction between a measured value and a model estimate stays explicit.

Usage

```
add_combine_reported(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: COMBINE (Soria et al. 2021, Ecology, CC0), reported table. Coverage: ~6.2k mammal species, keyed on the IUCN 2020 binomial. The reported table leaves a cell missing when no source measured that trait for a species; use `add_combine_imputed()` for the higher-coverage phylogenetically imputed values.

Value

The same data.frame with additional columns (reported values):

- combine_adult_mass_g** Adult body mass (g).
- combine_adult_body_length_mm** Adult head-body length (mm).
- combine_litter_size_n** Litter size (count).
- combine_litters_per_year_n** Litters per year (count).
- combine_max_longevity_d** Maximum longevity (days).
- combine_gestation_length_d** Gestation length (days).
- combine_weaning_age_d** Weaning age (days).
- combine_generation_length_d** Generation length (days).
- combine_dispersal_km** Natal dispersal distance (km).
- combine_habitat_breadth_n** Number of IUCN habitats (count).

combine_diet_breadth_n Number of diet categories (count).
combine_trophic_level Trophic level (1 herbivore, 2 omnivore, 3 carnivore).
combine_activity_cycle Activity cycle (1 nocturnal, 2 cathemeral, 3 diurnal).
combine_foraging_stratum Foraging stratum (G/Ar/A/S/M).
combine_biogeographical_realm Biogeographical realm(s).

References

Soria CD et al. (2021) COMBINE: a coalesced mammal database of intrinsic and extrinsic traits. Ecology 102:e03344. doi:10.1002/ecy.3344

See Also

[add_combine\(\)](#) for reported values with imputed gaps filled and per-trait provenance; [add_combine_imputed\(\)](#) for the imputed values; [add_pantheria\(\)](#), [add_anage\(\)](#) for other mammal trait sources.

Examples

```
## Not run:
taxify("Vulpes vulpes", backbone = "gbif") |>
  add_combine_reported()

## End(Not run)
```

add_common_names	<i>Add common (vernacular) names</i>
------------------	--------------------------------------

Description

Joins vernacular names to a [taxify\(\)](#) result by looking up accepted_name, filtered by language.

Usage

```
add_common_names(x, lang = "en", cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
lang	Character. ISO 639-1 language code (e.g., "en", "de", "fr"), or NA to return names without a language tag (NCBI/OTT sources). Default "en". List the languages present with enrichment_groups("common_names") .
cols	Which columns to attach. NULL (the default) attaches the curated set; a character vector of column names attaches just those, and "all" attaches every column the source carries (see enrichment_cols()).
verbose	Logical. Default TRUE.

Details

Common names are merged from three sources:

- GBIF backbone vernacular names (CC0) — multi-language via ISO 639-1 codes.
- NCBI Taxonomy common names (public domain) — no language tag (lang = NA).
- Open Tree of Life common names (CC0) — no language tag (lang = NA).

When multiple common names exist for a species in the requested language, the first (most commonly used) is returned.

Value

The same data.frame with an additional column:

common_name The vernacular name in the requested language, or NA if none is available.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur") |>
  add_common_names()

taxify("Quercus robur") |>
  add_common_names(lang = "de")

options(old)
```

add_copepod_traits	<i>Add copepod traits (Brun et al. 2017)</i>
--------------------	--

Description

Joins marine-copepod traits from the trait database of Brun et al. (2017) to a `taxify()` result by looking up `accepted_name`. Records are reduced to per-species values (numeric by median, categorical by mode).

Usage

```
add_copepod_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: A trait database for marine copepods (Brun et al. 2017), PANGAEA, CC BY 3.0.

Value

The same data.frame with additional columns. The default set:

cop_body_length_mm Body length (mm).

cop_egg_diameter_um Egg outer diameter (micrometres).

cop_clutch_size Clutch size.

cop_feeding_mode Feeding mode.

cop_spawning_strategy Spawning strategy.

cols = "all" also attaches feeder type, myelination, resting-egg presence, and the per-species min/max/n spread of the numeric values.

References

Brun P, Payne MR, Kiorboe T (2017) A trait database for marine copepods. Earth System Science Data 9:99-113. doi:[10.5194/essd9992017](https://doi.org/10.5194/essd9992017)

Examples

```
## Not run:
# Downloads the enrichment on first use.
taxify("Calanus finmarchicus", backbone = "gbif") |>
  add_copepod_traits()

## End(Not run)
```

add_coral_traits	<i>Add scleractinian coral traits (Coral Trait Database)</i>
------------------	--

Description

Joins species-level coral functional traits to a `taxify()` result by looking up accepted_name. Values are aggregated from the long-format Coral Trait Database (numeric traits by median, categorical traits by mode).

Usage

```
add_coral_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Coral Trait Database (Madin et al. 2016, Scientific Data, CC BY 4.0). Coverage: ~1.5k coral species.

Value

The same data.frame with additional columns:

coral_symbiotic_state Zooxanthellate / azooxanthellate.
coral_growth_form Typical growth form (massive/branching/...).
coral_colonality Colonial / solitary.
coral_substrate_attachment Attached / unattached.
coral_sexual_system Hermaphrodite / gonochore.
coral_larval_development_mode Spawner / brooder.
coral_symbiont_clade Symbiodinium clade.
coral_corallite_width_max_mm Maximum corallite width (mm).
coral_colony_max_diameter_cm Maximum colony diameter (cm).
coral_growth_rate_mm_yr Linear extension rate (mm/year).
coral_depth_lower_m Lower depth limit (m).
coral_depth_upper_m Upper depth limit (m).
coral_skeletal_density_g_cm3 Skeletal density (g/cm3).

References

Madin JS et al. (2016) The Coral Trait Database, a curated database of trait information for coral species from the global oceans. Scientific Data 3:160017. doi:10.1038/sdata.2016.17

Examples

```
## Not run:
taxify("Acropora millepora", backbone = "gbif") |>
  add_coral_traits()

## End(Not run)
```

add_data	<i>Add custom data by taxonomic matching</i>
----------	--

Description

Joins an external data source (CSV file or data.frame) to a `taxify()` result. Species names in the external data are matched through the same backbone(s) used in the original `taxify()` call, and the join is performed on `accepted_id` — so synonyms in either dataset resolve to the same key.

Usage

```
add_data(
  x,
  data,
  species_col = NULL,
  table = NULL,
  sheet = NULL,
  start_row = NULL,
  cols = NULL,
  group_col = NULL,
  groups = "all",
  fuzzy = TRUE,
  fuzzy_threshold = 0.2,
  verbose = TRUE
)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>data</code>	One of: • A data.frame already in R. • A file path to a .csv, .csv.gz, .tsv, .tsv.gz, .xlsx, .sqlite/.db, or .vtr file (read via vectra).
<code>species_col</code>	Character. Name of the column in data that contains species names. If NULL (default), auto-detected by matching head(10) of each character column against the backbone.
<code>table</code>	Character. Required when data is a SQLite file — the table name to read.
<code>sheet</code>	Integer or character. Sheet to read when data is an .xlsx file. Default NULL (auto-detect the sheet containing species names). Set explicitly to skip auto-detection.
<code>start_row</code>	Integer. Row where column headers begin in an .xlsx file. Default NULL (auto-detect by scanning the first 20 rows for a header row that produces species name matches). Set explicitly when the layout is known.
<code>cols</code>	Character vector of column names from data to join. If NULL (default), all columns except <code>species_col</code> are joined.

group_col	Character or NULL. Column in data that defines groups (e.g., country codes, regions). When set, the output is pivoted to wide format with one column per group (e.g., trait_AT, trait_DE), just like the built-in grouped enrichments. Use <code>taxify_long()</code> to reshape back to long format. Default NULL (flat join, one row per species).
groups	Character vector or "all". Which groups to include when group_col is set. Default "all".
fuzzy	Logical. Enable fuzzy matching for names in data. Default TRUE.
fuzzy_threshold	Numeric. Maximum allowed distance for fuzzy matches. Default 0.2.
verbose	Logical. Default TRUE.

Details

The workflow:

1. Read data (CSV or data.frame).
2. Identify the species column (explicit or auto-detected).
3. Match species names through the same backbone(s) as the original `taxify()` call, obtaining `accepted_id` for each row.
4. Check for conflicting duplicates: if multiple rows in data resolve to the same `accepted_id` with different values, an error is raised (unless `group_col` is set). Exact duplicates produce a warning and are deduplicated.
5. Left-join on `accepted_id`.

Grouped data:

When your data has multiple rows per species (e.g., one row per species per country), set `group_col` to produce wide output with suffixed columns. This is the same format as the built-in grouped enrichments.

Auto-detection:

When `species_col` is not specified, `add_data()` takes the first 10 rows of each character column and runs them through `taxify()`. The column with the highest match rate is selected. If no column achieves at least 50% matches, an error is raised asking the user to specify `species_col` explicitly.

Value

The input data.frame with additional columns from data, joined via backbone-resolved `accepted_id`. Columns from data that collide with existing columns in `x` are prefixed with "data_".

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

result <- taxify(c("Quercus robur", "Pinus sylvestris"))
traits <- data.frame(species = c("Quercus robur", "Pinus sylvestris"),
```

```

      height = c(30, 25))
result |> add_data(traits, species_col = "species")

options(old)

```

add_diaz_traits	<i>Add seed mass and plant height (Diaz et al. 2022)</i>
-----------------	--

Description

Joins species-level mean seed mass and plant height from Diaz et al. (2022) to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_diaz_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Diaz et al. 2022, TRY File Archive (CC BY 3.0). Coverage: ~46k plant species. Plants only.

Value

The same data.frame with additional columns:

seed_mass_mg Seed mass in milligrams (species-level mean).

plant_height_m Plant height in metres (species-level mean).

References

Diaz S et al. (2022) The global spectrum of plant form and function: enhanced species-level trait data. TRY File Archive.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur") |>
  add_diaz_traits()

options(old)
```

add_disperse	<i>Add aquatic-invertebrate dispersal traits (DISPERSE)</i>
--------------	---

Description

Joins genus-level dispersal-related traits for European aquatic macroinvertebrates to a [taxify\(\)](#) result by genus. Each fuzzy-coded trait is reduced to its dominant modality (with the database's own labels).

Usage

```
add_disperse(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: DISPERSE (Sarremejane et al. 2020, Scientific Data, CC-BY 4.0). Joins on genus because the database is genus-resolved.

Value

The same data.frame with categorical `disperse_body_size_cm`, `disperse_life_cycle`, `disperse_repro_cycles`, `disperse_dispersal`, `disperse_adult_lifespan`, `disperse_female_wing_mm`, `disperse_wing_type`, `disperse_fecundity`, `disperse_drift`, and the numeric bin-midpoint columns `disperse_body_size_cm_mid`, `disperse_female_wing_mm_mid`, `disperse_fecundity_mid` (all joined on genus).

References

Sarremejane R et al. (2020) DISPERSE, a trait database to assess the dispersal potential of European aquatic macroinvertebrates. Scientific Data 7:386. [doi:10.6084/m9.figshare.c.5000633](https://doi.org/10.6084/m9.figshare.c.5000633)

Examples

```
## Not run:
taxify("Baetis rhodani", backbone = "gbif") |>
  add_disperse()

## End(Not run)
```

add_ecoflora

Add British plant traits from Ecoflora

Description

Joins traits from the Ecological Flora of the British Isles (Fitter & Peat 1994) to a [taxify\(\)](#) result by looking up `accepted_name`. Ecoflora covers the vascular flora of the British Isles, providing canopy height, leaf traits, life form, flowering phenology, pollination and reproduction, seed weight, and British-calibrated Ellenberg indicator values. Every column carries a `_uk` suffix to mark the British-flora calibration and to avoid collisions when chained with other plant-trait enrichments (e.g. [add_baseflor\(\)](#) for France, [add_floraweb\(\)](#) for Germany).

Usage

```
add_ecoflora(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by taxify() .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Ecoflora (Ecological Flora of the British Isles). Ecoflora has no bulk download or API; the bundled dataset was collected one species at a time and is redistributed under the source licence (CC BY-NC-SA 4.0). The `.vtr` is downloaded from the taxify release on first use and cached.

For French-flora traits see [add_baseflor\(\)](#); for German-flora traits see [add_floraweb\(\)](#); for European-calibration indicator values see [add_eive\(\)](#).

Value

The same data.frame with additional `_uk` columns:

height_max_mm_uk, height_min_mm_uk Canopy height range (mm).

leaf_area_uk Leaf area class.

leaf_longevity_uk Leaf longevity (e.g. evergreen, deciduous).

root_system_uk Root system type.
photosynthetic_pathway_uk Photosynthetic pathway (C3/C4/CAM).
life_form_uk Raunkiaer life form.
reproduction_uk Reproduction method.
flower_begin_month_uk, flower_end_month_uk Flowering months (1-12).
pollination_vector_uk Pollen vector(s).
seed_weight_mg_uk Seed weight (mg).
propagule_uk Propagule / dispersule type.
ell_light_uk, ell_moisture_uk, ell_reaction_uk, ell_nitrogen_uk, ell_salt_uk Ellenberg indicator values calibrated for the British flora (light, moisture, reaction, nitrogen, salt).

References

Fitter AH, Peat HJ (1994) The Ecological Flora Database. *Journal of Ecology* 82:415-425.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Bellis perennis") |>
  add_ecoflora()

options(old)
```

add_edwards_phyto	<i>Add phytoplankton nutrient-uptake traits (Edwards et al.)</i>
-------------------	--

Description

Joins species-level phytoplankton nutrient physiology (Droop/Monod uptake and growth parameters for ammonium, nitrate and phosphorus, plus cell size and carbon content) to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_edwards_phyto(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Edwards et al. (2015, Ecology, CC BY 4.0), a compilation of phytoplankton nutrient-utilization traits for ~130 species. Single-source physiological data with no cross-source analogue, so it is surfaced through this door rather than the cross-source `add_trait()` verb.

Value

The same data.frame with additional columns. The curated set:

edwards_taxon_group Coarse phytoplankton group (diatom, green, ...).

edwards_habitat_system Habitat (marine/freshwater).

edwards_cell_volume Cell volume (micron³).

edwards_carbon_per_cell Carbon content per cell (pg C).

edwards_mu_inf_nit Maximum growth rate on nitrate (per day).

edwards_k_nit Half-saturation constant for growth on nitrate.

edwards_qmin_nit Minimum cell nitrogen quota.

edwards_mu_inf_p Maximum growth rate on phosphorus (per day).

edwards_k_p Half-saturation constant for growth on phosphorus.

edwards_qmin_p Minimum cell phosphorus quota.

With `cols = "all"` the full set of ammonium/nitrate/phosphorus uptake and quota parameters (`vmax_amm`, `mu_nit`, `vmax_p`, `qmax_p`, ...) is attached under their source names. All uptake/quota traits are joined on `accepted_name`.

References

Edwards KF, Thomas MK, Klausmeier CA, Litchman E (2015) Phytoplankton growth and the interaction of light and temperature: A synthesis at the species and community level. Ecology 96(9):2554-2564. doi:10.1890/142252.1

Examples

```
## Not run:
taxify("Thalassiosira pseudonana", backbone = "gbif") |>
  add_edwards_phyto()

## End(Not run)
```

add_eive	<i>Add EIVE ecological indicator values</i>
----------	---

Description

Joins EIVE 1.0 (Dengler et al. 2023) ecological indicator values to a [taxify\(\)](#) result by looking up accepted_name. EIVE provides continuous indicator values for European vascular plants, superseding the original ordinal Ellenberg values.

Usage

```
add_eive(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: EIVE 1.0 (Dengler et al. 2023, Zenodo, CC BY 4.0). Coverage: ~14.5k European vascular plant species.

Value

The same data.frame with additional columns:

- eive_light** Light indicator value (continuous).
- eive_temperature** Temperature indicator value (continuous).
- eive_moisture** Moisture indicator value (continuous).
- eive_reaction** Soil reaction (pH) indicator value (continuous).
- eive_nutrients** Nutrient indicator value (continuous).

References

Dengler J et al. (2023) EIVE 1.0 – a standardized set of Ecological Indicator Values for Europe. Vegetation Classification and Survey 4:7-29. doi:10.3897/VCS.98324

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Arrhenatherum elatius") |>
  add_eive()

options(old)
```

add_elton_traits	<i>Add diet, foraging, and body mass (EltonTraits 1.0)</i>
------------------	--

Description

Joins EltonTraits 1.0 diet composition, foraging strata, body mass, and activity data to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_elton_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: EltonTraits 1.0 (Wilman et al. 2014, Figshare, CC0). Coverage: ~15.4k species. Birds and mammals only.

Value

The same data.frame with additional columns:

diet_inv Percentage of diet: invertebrates.
diet_vend Percentage of diet: endothermic vertebrates.
diet_vect Percentage of diet: ectothermic vertebrates.
diet_vfish Percentage of diet: fish.
diet_vunk Percentage of diet: unknown vertebrates.
diet_scav Percentage of diet: scavenging.
diet_fruit Percentage of diet: fruit.

diet_nect Percentage of diet: nectar.

diet_seed Percentage of diet: seeds and nuts.

diet_plantother Percentage of diet: other plant material.

foraging_water Percentage of foraging: below water surface.

foraging_ground Percentage of foraging: on ground.

foraging_understory Percentage of foraging: in understory.

foraging_midhigh Percentage of foraging: in mid to high strata.

foraging_canopy Percentage of foraging: in canopy.

foraging_aerial Percentage of foraging: aerial.

elton_body_mass_g Body mass in grams.

nocturnal Nocturnal activity (0 = diurnal, 1 = nocturnal).

diet_guild Dominant diet guild derived from the ten diet-fraction columns (fractions summed within guild, the guild reaching 50 percent wins, otherwise omnivore): carnivore, herbivore, omnivore, invertivore, frugivore, granivore, nectarivore, scavenger. Also reachable across sources via `add_trait(x, "diet_guild")`.

References

Wilman H et al. (2014) EltonTraits 1.0: Species-level foraging attributes of the world's birds and mammals. *Ecology* 95:2027.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Parus major", backbone = "gbif") |>
  add_elton_traits()

options(old)
```

add_epa_freshwater	<i>Add freshwater invertebrate traits (US EPA)</i>
--------------------	--

Description

Joins primary functional traits of freshwater macroinvertebrates from the U.S. EPA Freshwater Biological Traits Database to a `taxify()` result. Records are reduced to per-taxon modes. The database records each trait at the finest available resolution, so the join matches `accepted_name` first and then fills any trait still missing from the taxon's genus-level row; a species-level value is never overwritten.

Usage

```
add_epa_freshwater(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: U.S. EPA Freshwater Biological Traits Database (2012), a public-domain U.S. Government work, compiled primarily from Vieira et al. (2006).

Value

The same data.frame with additional columns. The default set:

epa_feeding_mode Functional feeding group.
epa_habit Primary habit (e.g. clinger, burrower, swimmer).
epa_voltinism Number of generations per year.
epa_thermal_preference Thermal preference.
epa_body_size_class Maximum body-size class.

cols = "all" also attaches body shape, rheophily, oviposition behaviour, and diapause.

References

U.S. Environmental Protection Agency (2012) Freshwater Biological Traits Database. Compiled from Vieira NKM et al. (2006) A database of lotic invertebrate traits for North America, USGS Data Series 187.

Examples

```
## Not run:
# Downloads the enrichment on first use.
taxify("Baetis", backbone = "gbif") |>
  add_epa_freshwater()

## End(Not run)
```

add_eupolltrait	<i>Add European pollinator traits (EuPollTrait)</i>
-----------------	---

Description

Joins European bee and hoverfly morphological, biogeographic and ecological traits to a [taxify\(\)](#) result by accepted_name.

Usage

```
add_eupolltrait(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: EuPollTrait (Milicic et al. 2025, Zenodo, CC-BY 4.0).

Value

The same data.frame with eupolltrait_ columns: numeric itd_mm, tongue_length_mm, species_temperature_index, species_continental_index, area_of_occupancy, extent_of_occurrence; categorical sociality, nest, larval_nutrition, body_length_category.

References

Milicic M et al. (2025) EuPollTrait: a trait database for European bees and hoverflies. Zenodo. [doi:10.5281/zenodo.18032357](https://doi.org/10.5281/zenodo.18032357)

Examples

```
## Not run:
taxify("Bombus terrestris", backbone = "gbif") |>
  add_eupolltrait()

## End(Not run)
```

add_eurobat	<i>Add European bat traits (EuroBaTrait)</i>
-------------	--

Description

Joins species-level traits of European bats (morphology, life history, diet, foraging habitat, roost type) to a `taxify()` result by looking up `accepted_name`.

Usage

```
add_eurobat(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Froidevaux et al. (2023, Scientific Data, CC BY 4.0), EuroBaTrait 1.0. Thematic measurement-or-fact tables are reduced to species-level values (numeric by median, categorical by mode).

Value

The same data.frame with additional columns. The curated set:

eurobat_forearm_length_mm Forearm length (mm).

eurobat_body_mass_g Body mass (g).

eurobat_max_longevity_yr Maximum recorded longevity (years).

eurobat_litter_size Litter size.

eurobat_diet_type Diet type (insectivorous, frugivorous, ...).

eurobat_first_main_prey First main prey item.

With `cols = "all"` the full trait set (digit lengths, wing indices, habitat affinity scores, critical feeding areas, roost dependence, phenology, ...) is attached under their source names.

References

Froidevaux JSP et al. (2023) EuroBaTrait 1.0: a species-level trait dataset of bats in Europe and beyond. Scientific Data. figshare [doi:10.6084/m9.figshare.21777161](https://doi.org/10.6084/m9.figshare.21777161)

Examples

```
## Not run:
taxify("Myotis myotis", backbone = "gbif") |>
  add_eurobat()

## End(Not run)
```

add_fishbase	<i>Add fish traits (FishBase)</i>
--------------	-----------------------------------

Description

Joins FishBase morphological and ecological traits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_fishbase(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: FishBase via rfishbase (Froese & Pauly, CC BY-NC 4.0). Coverage: ~35k fish species. Fishes only.

The build-from-source fallback requires the **rfishbase** package (available on CRAN). Pre-built .vtr files do not require rfishbase.

Value

The same data.frame with additional columns:

fb_body_length_cm Maximum body length in centimetres.

fb_body_mass_g Body mass in grams (estimated from length-weight relationships where available).

fb_trophic_level Trophic level.

fb_depth_min_m Minimum depth in metres.

fb_depth_max_m Maximum depth in metres.

fb_vulnerability Vulnerability index (0–100).

fb_habitat Habitat type (e.g. demersal, pelagic).

fb_importance Commercial importance category.

References

Froese R, Pauly D (eds.) (2024) FishBase. World Wide Web electronic publication, <https://www.fishbase.org>.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Gadus morhua", backbone = "gbif") |>
  add_fishbase()

options(old)
```

add_fishmorph	<i>Add freshwater fish morphological traits (FISHMORPH)</i>
---------------	---

Description

Joins FISHMORPH morphological trait data to a `taxify()` result by looking up `accepted_name`. This is the source-named door for FISHMORPH; for the fish reference database FishBase see `add_fishbase()`.

Usage

```
add_fishmorph(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: FISHMORPH (Brosse et al. 2021, Figshare, CC BY 4.0). Coverage: ~9k freshwater fish species.

Value

The same data.frame with additional columns:

- fish_max_body_length** Maximum body length (cm).
- fish_body_elongation** Body elongation (body length / body depth).
- fish_vertical_eye_position** Vertical eye position (eye position / head depth).

fish_relative_eye_size Relative eye size (eye diameter / head length).

fish_oral_gape_position Oral gape position (mouth position: 0 = inferior, 0.5 = terminal, 1 = superior).

fish_relative_maxillary_length Relative maxillary length (maxillary length / head length).

fish_body_lateral_shape Body lateral shape (body depth / caudal peduncle depth).

fish_pectoral_fin_position Pectoral fin vertical position (fin insertion depth / body depth).

fish_pectoral_fin_size Pectoral fin size (fin length / body length).

fish_caudal_peduncle_throttling Caudal peduncle throttling (caudal peduncle depth / caudal fin depth).

References

Brosse S, Charpin N, Su G, Toussaint A, Herrera-R GA, Tedesco PA, Villeg ér S (2021) FISH-MORPH: A global database on morphological traits of freshwater fishes. Global Ecology and Biogeography 30:2330-2336. doi:10.1111/geb.13395

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Salmo trutta", backbone = "gbif") |>
  add_fishmorph()

options(old)
```

add_fishtraits	<i>Add United States freshwater fish traits (FishTraits)</i>
----------------	--

Description

Joins ecological and life-history traits of United States freshwater fishes from FishTraits (Frimpong & Angermeier 2009) to a `taxify()` result by looking up accepted_name.

Usage

```
add_fishtraits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: FishTraits v14.3 (USGS ScienceBase), a public-domain U.S. Government work. North American freshwater fishes.

Value

The same data.frame with additional columns. The default set:

ft_common_name Common name.

ft_native Whether native to the contiguous United States.

ft_max_length_cm Maximum total length (cm).

ft_longevity_yr Maximum reported age (years).

ft_maturity_age_yr Age at maturity (years).

ft_fecundity_max Maximum fecundity.

ft_repro_guild Reproductive guild.

ft_min_temp_c Lower temperature tolerance (deg C).

ft_max_temp_c Upper temperature tolerance (deg C).

ft_extinct Whether recorded as extinct.

cols = "all" also attaches the ten diet-category flags, salinity tolerance, flow preferences, migratory strategy, listing status, and the ITIS TSN.

References

Frimpong EA, Angermeier PL (2009) FishTraits: a database of ecological and life-history traits of freshwater fishes of the United States. *Fisheries* 34:487-495.

Examples

```
## Not run:  
# Downloads the enrichment on first use.  
taxify("Micropterus salmoides", backbone = "gbif") |>  
  add_fishtraits()  
  
## End(Not run)
```

add_floraweb

Add German plant traits from FloraWeb

Description

Joins traits from FloraWeb (Bundesamt fuer Naturschutz) to a `taxify()` result by looking up `accepted_name`. FloraWeb is the live national portal carrying the BiolFlor trait data (Klotz, Kuehn & Durka 2002) together with Rothmaler morphology and Ellenberg indicator values. This enrichment covers the full per-species trait profile scraped from the four FloraWeb trait pages: morphology, reproductive biology, the nine Ellenberg indicator values, ploidy and chromosome number, and chorological distribution. Every column carries a `_de` suffix to mark the German-flora calibration and to avoid collisions when chained with other plant-trait enrichments (e.g. `add_ecoflora()` for Britain, `add_baseflor()` for France).

Usage

```
add_floraweb(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which FloraWeb columns to attach. <code>NULL</code> (the default) attaches all of them; a character vector of <code>_de</code> column names attaches just those (see <code>enrichment_cols()</code> , or the columns listed below). Pass <code>"all"</code> for the full set explicitly.
<code>verbose</code>	Logical. Default <code>TRUE</code> .

Details

Source: FloraWeb (<https://www.floraweb.de/>), Bundesamt fuer Naturschutz, Bonn. FloraWeb has no bulk export or API; the bundled dataset was scraped per species (accessed 2026-06-24) and that access date is the dataset version. The trait data largely derive from BiolFlor, which per the BioFresh metadata statement is publicly available and may be used without restrictions provided it is acknowledged and cited correctly. The `.vtr` is downloaded from the taxify release on first use and cached.

For British-flora traits see `add_ecoflora()`; for French-flora traits see `add_baseflor()`; for European-calibration indicator values see `add_eive()`.

Value

The same data.frame with German trait columns (all suffixed `_de`), grouped as:

Morphology `height_de`, `life_form_de`, `leaf_shape_de`, `leaf_anatomy_de`, `leaf_persistence_de`, `storage_organs_de`, `flowering_months_de`, `flowering_months_biolflor_de`, `flowering_phase_de`, `phenological_season_de`, `description_de`.

Reproductive biology pollination_vector_de, pollinator_de, pollinator_reward_de, flower_type_de, flower_class_de, dispersal_type_de, diaspore_type_de, germinule_type_de, reproduction_type_de, vegetative_spread_de, fertilization_type_de, apomixis_de, dicliny_de, dichogamy_de, self_incompatibility_de, si_mechanism_de, ploidy_de, chromosome_number_de, chromosome_freq_de, chromosomes_de.

Ecology the nine Ellenberg indicator values ell_light_de, ell_temperature_de, ell_continentality_de, ell_moisture_de, ell_moisture_variability_de, ell_reaction_de, ell_nitrogen_de, ell_salt_de, heavy_metal_resistance_de, plus strategy_type_de (Grime CSR), habitat_site_de, formation_de, plant_community_de, biotope_type_de, forest_binding_de, hemeroby_de, urbanity_de.

Distribution floristic_zones_de, areal_formula_de, areal_type_de, oceanity_de, range_centre_de, world_range_size_de, world_range_frequency_de, world_range_position_de, world_range_hazard_de, germany_range_share_de, germany_responsibility_de.

Categorical traits with several applicable values are joined with "; ". Trait values are German (as published by FloraWeb / BiolFlor).

References

Klotz S, Kuehn I, Durka W (2002) BIOLFLOR - Eine Datenbank zu biologisch-oekologischen Merkmalen der Gefaesspflanzen in Deutschland. Schriftenreihe fuer Vegetationskunde 38. Bundesamt fuer Naturschutz, Bonn.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Bellis perennis") |>
  add_floraweb()

options(old)
```

```
add_freshwater_insects_conus
```

Add freshwater-insect genus traits (Freshwater Insects CONUS)

Description

Joins genus-level ecological and life-history trait modalities of North American freshwater insects to a `taxify()` result by looking up genus, so any species in a covered genus is annotated. The modalities are the source's own abbreviation codes, kept verbatim.

Usage

```
add_freshwater_insects_conus(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Twardochleb et al. (2021, Environmental Data Initiative, CC BY 4.0), the Freshwater Insects CONUS genus trait table. Traits are genus-level categorical modalities.

Value

The same data.frame with additional columns. The curated set:

fwinsect_thermal_pref Thermal preference class.

fwinsect_feed_prim Primary functional feeding group code.

fwinsect_habit_prim Primary habit (swimmer, clinger, burrower, ...).

fwinsect_rheophily Rheophily (current preference) code.

fwinsect_voltinism Voltinism (generations per year) code.

fwinsect_max_body_size Maximum body size class.

With `cols = "all"` the remaining trait groups (emergence, dispersal, respiration, ...) are attached under their source names.

References

Twardochleb LA et al. (2021) Freshwater insect occurrences and traits for the contiguous United States, 2001-2018. Environmental Data Initiative. doi:[10.6073/pasta/8238ea9bc15840844b3a023b6b6ed158](https://doi.org/10.6073/pasta/8238ea9bc15840844b3a023b6b6ed158)

Examples

```
## Not run:
taxify("Baetis", backbone = "gbif") |>
  add_freshwater_insects_conus()

## End(Not run)
```

add_frugivoria	<i>Add Neotropical frugivore traits (Frugivoria)</i>
----------------	--

Description

Joins shared bird/mammal frugivore traits to a [taxify\(\)](#) result by accepted_name.

Usage

```
add_frugivoria(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Gerstner et al. (2023) Frugivoria (EDI, CC-BY 4.0).

Value

The same data.frame with frugivoria_ columns: categorical taxon_group, diet_category; numeric diet_breadth, body_mass_g, body_size_mm, longevity, generation_time.

References

Gerstner BE et al. (2023) Frugivoria: a trait database for birds and mammals exhibiting frugivory across contiguous Neotropical moist forests. EDI (edi.1220.5).

Examples

```
## Not run:
taxify("Ramphastos toco", backbone = "gbif") |>
  add_frugivoria()

## End(Not run)
```

add_fungalroot	<i>Add mycorrhizal type from FungalRoot</i>
----------------	---

Description

Joins genus-level mycorrhizal type from the FungalRoot database (Soudzilovskaia et al. 2020) to a `taxify()` result by looking up genus. Mycorrhizal type is phylogenetically conserved at the genus level, which is the resolution FungalRoot recommends for inference, so this enrichment joins on genus rather than `accepted_name`.

Usage

```
add_fungalroot(x, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: FungalRoot, published on GBIF as a Darwin Core Archive ([doi:10.15468/a7ujmj](https://doi.org/10.15468/a7ujmj)), CC BY-NC 4.0. The per-genus value is a majority consensus computed from the per-observation mycorrhiza type labels, not FungalRoot's own published per-genus assignment. Plant genera only. The `.vtr` is downloaded from the taxify release on first use and cached.

Value

The same data.frame with three additional columns:

mycorrhizal_type Genus-level majority-consensus type, one of AM (arbuscular), EcM (ecto), ErM (ericoid), OM (orchid), NM (non-mycorrhizal), the dual types EcM-AM / ErM-EcM / ErM-AM, Other, or uncertain. NA if the genus is not in FungalRoot.

mycorrhizal_status Coarse status derived from the type: "mycorrhizal", "non-mycorrhizal", or "uncertain".

mycorrhizal_records Number of FungalRoot observations supporting the genus-level consensus.

References

Soudzilovskaia NA et al. (2020) FungalRoot: global online database of plant mycorrhizal associations. *New Phytologist* 227:955-966.

Examples

```
## Not run:
# Joins on genus, so any species in a covered genus is annotated.
taxify(c("Quercus robur", "Trifolium pratense")) |>
  add_fungalroot()

## End(Not run)
```

add_fungal_traits	<i>Add fungal lifestyle and trait data (FungalTraits)</i>
-------------------	---

Description

Joins FungalTraits (Polme et al. 2020) genus-level trait data to a [taxify\(\)](#) result by looking up genus. Unlike other enrichments that join on species-level accepted_name, FungalTraits is a genus-level database and joins on the genus column already present in taxify output.

Usage

```
add_fungal_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: FungalTraits (Polme et al. 2020, Fungal Diversity, CC BY 4.0). Coverage: ~10k fungal genera. Genus-level only (not species-level).

Value

The same data.frame with additional columns:

primary_lifestyle Primary ecological role (e.g., saprotroph, mycorrhizal, pathogen, endophyte, lichenized, parasite).

secondary_lifestyle Secondary ecological role, if any.

growth_form Morphological growth form (e.g., agaricoid, corticioid, polyporoid, yeast).

fruitbody_type Fruiting body morphology (e.g., gasteroid, pileate, resupinate).

decay_substrate Substrate type for saprotrophic genera (e.g., wood, litter, dung, soil).

plant_pathogenic_capacity Capacity to cause plant disease (e.g., high, medium, low, none).

animal_biotrophic_capacity Capacity for animal biotrophy.

endophytic_interaction_capability Capacity for endophytic interactions with plants.

ectomycorrhiza_exploration_type Exploration type for ectomycorrhizal genera (e.g., contact, short, medium, long).

References

Polme S et al. (2020) FungalTraits: a user-friendly traits database of fungi and fungus-like stramenopiles. Fungal Diversity 105:1-16. doi:10.1007/s13225-020-00466-2

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Amanita muscaria", backbone = "gbif") |>
  add_fungal_traits()

options(old)
```

add_funguild	<i>Add fungal functional guild data (FUNGuild)</i>
--------------	--

Description

Joins FUNGuild trophic mode, guild, growth morphology, and confidence data to a [taxify\(\)](#) result by looking up accepted_name. Species-level matches take priority; genus-level guild assignments are used as fallback for unmatched species.

Usage

```
add_funguild(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: FUNGuild (Nguyen et al. 2016, CC BY 4.0). Coverage: ~13k taxa. Fungi only.

The enrichment first attempts species-level matching. For species without a direct match, it falls back to genus-level guild assignments from FUNGuild's genus-rank entries.

Value

The same data.frame with additional columns:

trophic_mode Trophic mode (e.g., Pathotroph, Saprotroph, Symbiotroph, or hyphenated combinations).

guild Functional guild (e.g., "Ectomycorrhizal", "Plant Pathogen", "Wood Saprotroph").

funguild_growth_form Growth morphology (e.g., "Agaricoid", "Microfungus"). Prefixed to avoid collision with FungalTraits.

confidence_ranking Confidence of the guild assignment (Possible, Probable, Highly Probable).

References

Nguyen NH et al. (2016) FUNGuild: An open annotation tool for parsing fungal community datasets by ecological guild. Fungal Ecology 20:241-248.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Amanita muscaria", backbone = "gbif") |>
  add_funguild()

options(old)
```

add_gbif_info	<i>Add GBIF-specific columns</i>
---------------	----------------------------------

Description

Joins extra GBIF backbone columns to a `taxify()` result by looking up `taxon_id` in the GBIF backbone. Only enriches rows where `backbone == "gbif"`.

Usage

```
add_gbif_info(x)
```

Arguments

`x` A data.frame returned by `taxify()` with `backbone == "gbif"`.

Value

The same data.frame with additional columns:

notho_type Hybrid type: "GENERIC", "SPECIFIC", or "INFRASPECIFIC".

nom_status Nomenclatural status (may contain multiple values).

bracket_authorship Basionym author in parentheses.

bracket_year Basionym author year.

gbif_year Combining author year.

name_published_in Publication citation.

origin How the name entered the backbone.

infra_specific_epithet Infraspecific epithet.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur", backbone = "gbif") |>
  add_gbif_info()

options(old)
```

add_gidias	<i>Add invasive-species impact (EICAT / SEICAT, GIDIAS)</i>
------------	---

Description

Joins per-species environmental- and socio-economic-impact aggregates from GIDIAS (Bacher et al. 2025), the IPBES invasive-species assessment’s global impact compilation, to a `taxify()` result by looking up `accepted_name`. GIDIAS’s individual impact records are reduced to per-species indicators; the raw impact records are not distributed.

Usage

```
add_gidias(x, group = "Any", cols = NULL, verbose = TRUE)
```

Arguments

- | | |
|-------|---|
| x | A data.frame returned by <code>taxify()</code> . |
| group | Character. Which affected native taxon the impact is measured against: <ul style="list-style-type: none">• "Any" (default): every impact record for the species, the species-level summary.• One of "Plant", "Invertebrate", "Vertebrate", "Microbe", "Fungi": only the impacts recorded against that group. |

- Several (e.g. `c("Plant", "Vertebrate")`): adds columns with a group suffix (e.g. `gidias_eicat_category_Plant`).
 - "all": one column set per group, "Any" included.
- List them with `enrichment_groups("gidias")`.
- cols** Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See [enrichment_cols](#).
- verbose** Logical. Default TRUE.

Details

A species' EICAT category is the most severe magnitude among its negative (harmful) environmental-impact records, on the IUCN scale "MC" (Minimal Concern), "MN" (Minor), "MO" (Moderate), "MR" (Major, local extinction), "MV" (Massive, global extinction), or "DD" (Data Deficient); `gidias_seicat_category` applies the same rule to socio-economic impact (SEICAT, "MC" to "MR"). For impact reconciled across sources, use `add_trait()` with "environmental_impact" or "socioeconomic_impact".

Source: GIDIAS (Bacher et al. 2025, Scientific Data; CC BY 4.0), compiled for the IPBES thematic assessment report on invasive alien species. Only the derived per-species aggregates are distributed here, not the raw impact records.

Value

The same data.frame with additional columns. The default set:

gidias_eicat_category EICAT environmental-impact category (MC/MN/MO/MR/MV/DD, or NA when no negative impact is recorded).

gidias_eicat_mechanism IUCN EICAT impact mechanism(s) behind the species' negative environmental impacts.

gidias_seicat_category SEICAT socio-economic-impact category (MC/MN/MO/MR/DD, or NA).

gidias_ncp_direction Direction of the species' impact on nature's contributions to people: "Negative", "Positive", "Neutral", or a combination ("Negative; Positive") where the records disagree. GIDIAS scores no magnitude for this block, so there is no category to report.

gidias_ias_taxon Functional group: Plant, Invertebrate, Vertebrate, or Microbe.

gidias_realms Realm(s) the impacts span: terrestrial, freshwater, and/or marine.

gidias_n_records Number of impact records for the species.

gidias_n_sources Number of distinct sources documenting the impacts.

`cols = "all"` additionally attaches the numeric EICAT/SEICAT magnitudes (0-3), the affected well-being constituents and contributions to people (`gidias_ncp_affected`), kingdom, the negative-record count, and a global-extinction flag.

What a species impacts

GIDIAS records the affected native taxon per impact record, so group asks the question at that grain: `add_gidias(group = "Invertebrate")` scores *Felis catus* "MO" (reduced populations) where the default "Any" scores it "MV", the global extinctions it drove among vertebrates. 28% of species with a recorded affected taxon impact two or more of the five groups, so for those the species-level category is the most severe impact on anything, not the impact on each thing.

The vocabulary is the coarse one GIDIAS controls: "Vertebrate", not "Aves". "Any" is the only group carrying the impact records with no affected taxon recorded (12% of the negative ones) and the two people-facing blocks, so `gidias_seicat_category` and `gidias_ncp_direction` are NA on every other group: impact on people is not a question the affected-native-taxon axis can answer.

References

Bacher S et al. (2025) Global Impacts Dataset of Invasive Alien Species (GIDIAS). Scientific Data 12:832. doi:10.1038/s41597025051845

Examples

```
## Not run:
# Downloads the GIDIAS enrichment on first use.
taxify("Felis catus", backbone = "gbif") |>
  add_gidias()

# What the cat does to invertebrates, rather than to anything at all.
taxify("Felis catus", backbone = "gbif") |>
  add_gidias(group = "Invertebrate")

taxify("Felis catus", backbone = "gbif") |>
  add_gidias(group = c("Invertebrate", "Vertebrate"))

## End(Not run)
```

add_gift	Add plant traits from GIFT
----------	----------------------------

Description

Joins species-level plant traits from GIFT, the Global Inventory of Floras and Traits (Weigelt et al. 2020), to a `taxify()` result by `accepted_name`. GIFT aggregates published trait records to one value per species (mean for numeric traits, most frequent entry for categorical ones). You choose which traits to attach with `cols`; browse the available columns with `gift_traits()`.

Usage

```
add_gift(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which GIFT trait columns to attach. One of: NULL (the default) for a convenient set of well-populated traits; the string "all" for every bundled trait; or a character vector of <code>gift_</code> column names (e.g. "plant_height_max", with or without the <code>gift_</code> prefix). See <code>gift_traits()</code> . When left NULL, a one-time message notes the default set and how to request all traits.
verbose	Logical. Default TRUE.

Details

The GIFT trait table is bundled as a pre-built .vtr and joined offline, so no internet access is needed once it is present (the first use downloads it, or builds it from source if `taxifydb` is installed). GIFT's API exposes only the redistributable subset of its data (CC BY 4.0; references whose underlying source is restricted are excluded), and that subset is what is bundled here. Cite GIFT and, where applicable, the underlying references (`GIFT::GIFT_references()`) when you use the values.

Value

The same `data.frame` with one added column per requested trait, named `gift_<trait>`. Numeric traits (heights, masses, areas) are doubles, the rest character. Rows with no value in GIFT get NA. With the default cols, the added columns are `gift_woodiness_1`, `gift_growth_form_1`, `gift_lifecycle_1`, `gift_life_form_1`, `gift_climber_1`, `gift_epiphyte_1`, `gift_parasite_1`, `gift_aquatic_1`, `gift_plant_height_max`, `gift_photosynthetic_pathway`, `gift_seed_mass_mean`, `gift_dispersal_syndrome_1`, `gift_flowering_start`, `gift_flowering_end`, `gift_deciduousness_1`, and `gift_sla_mean`.

References

Weigelt P, König C, Kreft H (2020) GIFT - A Global Inventory of Floras and Traits for macroecology and biogeography. *Journal of Biogeography* 47:16-43. doi:10.1111/jbi.13623 Denelle P, Weigelt P, Kreft H (2023) GIFT: an R package to access the Global Inventory of Floras and Traits. *Methods in Ecology and Evolution* 14:2738-2748. doi:10.1111/2041210X.14213

See Also

`gift_traits()` to browse the available columns.

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

taxify("Abies alba") |>
  add_gift()

options(old)
```

add_globi

Add biotic interaction degree (GloBI)

Description

Joins per-species biotic interaction breadth from GloBI (Global Biotic Interactions) to a `taxify()` result by looking up `accepted_name`. GloBI's aggregated interaction records are reduced to per-species counts: how many distinct partner taxa a species interacts with (undirected), across how many distinct interaction types, over how many interaction records.

Usage

```
add_globi(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: GloBI (Poelen et al. 2014), an open index of biotic interactions aggregated from many contributed datasets. Only derived per-species counts are distributed here; the underlying interaction records carry the licenses of their original data contributors, who should be cited in derivative work. Partner counts are resolved to accepted names before counting, so synonymous partners are not double-counted.

Value

The same data.frame with additional columns:

interaction_degree Number of distinct partner taxa recorded interacting with the species (both directions).

n_interaction_types Number of distinct interaction types (eats, pollinates, parasitises, ...).

n_interaction_records Total number of interaction records touching the species.

References

Poelen JH, Simons JD, Mungall CJ (2014) Global Biotic Interactions: An open infrastructure to share and analyze species-interaction datasets. *Ecological Informatics* 24:148-159. doi:10.1016/j.ecoinf.2014.08.005

Examples

```
## Not run:
taxify("Apis mellifera", backbone = "gbif") |>
  add_globi()

## End(Not run)
```

add_globtherm	<i>Add thermal tolerance limits (GlobTherm)</i>
---------------	---

Description

Joins GlobTherm upper and lower thermal tolerance limits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_globtherm(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: GlobTherm (Bennett et al. 2018, Scientific Data, CC0). Coverage: ~2.1k species across aquatic and terrestrial groups.

Value

The same data.frame with additional columns:

globtherm_thermal_max_c Upper thermal limit (degrees Celsius).

globtherm_thermal_max_metric Definition of the upper limit (e.g. ctm_{max}, LT50, U_{TNZ}); the value is ambiguous without it.

globtherm_thermal_min_c Lower thermal limit (degrees Celsius).

globtherm_thermal_min_metric Definition of the lower limit (e.g. ctm_{min}, LT50, L_{TNZ}).

globtherm_thermal_max_error Reported error on the upper limit.

globtherm_thermal_min_error Reported error on the lower limit.

References

Bennett JM et al. (2018) GlobTherm, a database on the thermal tolerance for aquatic and terrestrial organisms. Scientific Data 5:180022. doi:10.1038/sdata.2018.22

Examples

```
## Not run:
taxify("Lepomis gibbosus", backbone = "gbif") |>
  add_globtherm()

## End(Not run)
```

add_glonaf	<i>Add naturalized alien flora status (GloNAF)</i>
------------	--

Description

Joins GloNAF (Global Naturalized Alien Flora) data to a `taxify()` result, filtered by region.

Usage

```
add_glonaf(x, region, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
region	Character. GloNAF region identifier(s), or "all". Regions use TDWG-compatible codes extended with dot notation for sub-national units (e.g., "USA.CA" for California). • Single region: adds naturalized column (no suffix). • Multiple regions: adds naturalized_<region> columns. • "all": adds one column per region in the dataset.
verbose	Logical. Default TRUE.

Details

Source: GloNAF v2.0 (van Kleunen et al. 2019, Davis et al. 2025, CC BY 4.0). Coverage: ~16k alien plant taxa across ~1,300 regions. Plants only.

Value

The same data.frame with additional column(s):
naturalized Integer 1 if the species is recorded as naturalized in that region, NA otherwise.

References

van Kleunen M et al. (2019) The Global Naturalized Alien Flora (GloNAF) database. Ecology 100:e02542.
Davis K et al. (2025) The updated Global Naturalized Alien Flora (GloNAF 2.0) database. Ecology, e70245.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Robinia pseudoacacia") |>
  add_glonaf(region = "EUR")

taxify("Robinia pseudoacacia") |>
  add_glonaf(region = c("EUR", "NAM"))

options(old)
```

add_gmpd

Add mammal parasite burden (GMPD 2.0)

Description

Joins host-level parasite summaries from the Global Mammal Parasite Database (Stephens et al. 2017) to a [taxify\(\)](#) result by looking up accepted_name. The database's host-parasite association records are aggregated to one row per host species.

Usage

```
add_gmpd(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Covers wild carnivores, ungulates and primates (462 host species).

Parasite richness is a sampling-sensitive count: a well-studied host accumulates more recorded parasites than a rarely sampled one, so the values reflect research effort as well as biology.

This source states no licence – it is distributed under the journal's version-of-record terms with a citation request – so taxify ships no pre-built copy of it. The first call builds it from the original source on your own machine, which requires the taxifydb package (`remotes::install_github("gcol33/taxifydb")`). taxify redistributes none of the data. Cite Stephens et al. (2017) when you use it.

Value

The same data.frame with additional columns. The default set:

- gmpd_parasite_richness** Distinct parasite species recorded for the host.
- gmpd_n_helminth, gmpd_n_virus, gmpd_n_bacteria, gmpd_n_protozoa, gmpd_n_arthropod, gmpd_n_fungus, gmpd_n_mollusk** Distinct parasite species by parasite type.
- gmpd_mean_prevalence** Mean reported prevalence across the host’s records.
- gmpd_host_group** Host group (carnivores, ungulates, primates).

References

Stephens PR, Pappalardo P, Huang S, et al. (2017) Global Mammal Parasite Database version 2.0. Ecology 98:1476. doi:10.1002/ecy.1799

Examples

```
## Not run:
# Builds the enrichment on first use (needs taxifydb).
taxify("Panthera leo", backbone = "gbif") |>
  add_gmpd()

## End(Not run)
```

add_griis	Add invasive species status (GRIIS)
-----------	-------------------------------------

Description

Joins GRIIS (Global Register of Introduced and Invasive Species) status to a `taxify()` result, filtered by country. This is the source-named door for GRIIS; GloNAF (`add_glonaf()`) carries related naturalized-alien status.

Usage

```
add_griis(x, country, cols = NULL, verbose = TRUE)
```

Arguments

- x** A data.frame returned by `taxify()`.
- country** Character. ISO 3166-1 alpha-2 country code(s), or "all".
 - Single code (e.g., "AT"): adds `invasive_status` column (no suffix).
 - Multiple codes (e.g., c("AT", "DE")): adds `invasive_status_AT`, `invasive_status_DE`.
 - "all": adds one column per country in the dataset.
- List the codes GRIIS covers with `enrichment_groups("griis")`.

cols	Which columns to attach. NULL (the default) attaches the curated set; a character vector of column names attaches just those, and "all" attaches every column the source carries (see enrichment_cols()).
verbose	Logical. Default TRUE.

Details

Source: GRIIS (Zenodo combined CSV, CC BY 4.0, 196 countries). Coverage: ~23k name x country combinations.

Value

The same data.frame with additional column(s):

invasive_status One of "native", "introduced", "invasive", or NA if not recorded for that country.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Robinia pseudoacacia") |>
  add_griis(country = "AT")

taxify("Robinia pseudoacacia") |>
  add_griis(country = c("AT", "DE"))

options(old)
```

add_groot	<i>Add root traits (GRooT)</i>
-----------	--------------------------------

Description

Joins species-level root traits from the Global Root Traits (GRooT) database to a [taxify\(\)](#) result by looking up accepted_name. GRooT aggregates root trait records to per-species means. The .vtr carries the full GRooT trait set (38 root traits); the default attaches the nine best-populated key traits, and cols = "all" attaches every one. Run [enrichment_cols\("groot"\)](#) to list them.

Usage

```
add_groot(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the nine key traits below, "all" every GRooT trait, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: GRooT database (Guerrero-Ramirez et al. 2021). Vascular plants. GRooT data are publicly available and used here with the data-paper citation requested by the authors.

Value

The same data.frame with additional columns (per-species means). The default set:

root_diameter Mean root diameter.

specific_root_length Specific root length.

root_tissue_density Root tissue density.

root_n_concentration Root nitrogen concentration.

root_c_concentration Root carbon concentration.

root_mass_fraction Root mass fraction.

lateral_spread Lateral spread.

root_mycorrhizal_colonization Root mycorrhizal colonization intensity.

rooting_depth Maximum rooting depth.

`cols = "all"` additionally attaches root chemistry (P/K/Ca/Mg/Mn concentrations, C:N and N:P ratios), architecture (branching density and ratio, stele diameter and fraction, cortex thickness, vessel diameter and number), turnover (root lifespan, production, turnover rate, litter mass-loss rate), and specific root area, respiration, and dry-matter content, among others. Units follow the GRooT data paper; see the reference below.

References

Guerrero-Ramirez NR et al. (2021) Global root traits (GRooT) database. Global Ecology and Biogeography 30:25-37. doi:10.1111/geb.13179

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Abies alba") |>
  add_groot()

options(old)
```

add_gwdd	<i>Add wood density (Global Wood Density Database v2)</i>
----------	---

Description

Joins species-level wood density to a `taxify()` result by looking up `accepted_name`. Wood density is reported as wood specific gravity (oven-dry mass / green volume), dimensionless and numerically equal to g/cm³.

Usage

```
add_gwdd(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Global Wood Density Database v2 (Fischer et al. 2026, New Phytologist, CC BY 4.0).
Coverage: ~17.3k species. Bark density is not part of the aggregated source and is not included.

Value

The same data.frame with additional columns:

gwdd_wood_density_g_cm3 Species-mean wood density (g/cm³).
gwdd_wood_density_trunk_g_cm3 Trunk wood density (g/cm³).
gwdd_wood_density_branch_g_cm3 Branch wood density (g/cm³).
gwdd_n_measurements Number of underlying measurements.

References

Fischer FJ et al. (2026) The Global Wood Density Database version 2. New Phytologist. doi:10.1111/nph.70860

Examples

```
## Not run:
taxify("Quercus robur", backbone = "gbif") |>
  add_gwdd()

## End(Not run)
```

add_homerange	<i>Add mammal home-range size (HomeRange)</i>
---------------	---

Description

Joins species-median home-range size and body mass to a `taxify()` result by `accepted_name`.

Usage

```
add_homerange(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Broekman et al. (2023) HomeRange database (Dryad, CC0). Per-individual records are reduced to species medians.

Value

The same data.frame with numeric `homerange_home_range_km2` and `homerange_body_mass_kg`.

References

Broekman MJE et al. (2023) HomeRange: a global database of mammalian home ranges. Dryad. [doi:10.5061/dryad.d2547d85x](https://doi.org/10.5061/dryad.d2547d85x)

Examples

```
## Not run:
taxify("Panthera leo", backbone = "gbif") |>
  add_homerange()

## End(Not run)
```

add_hosts	<i>Add Lepidoptera hostplant breadth (NHM HOSTS)</i>
-----------	--

Description

Joins per-insect hostplant breadth from the Natural History Museum HOSTS database to a `taxify()` result by looking up `accepted_name`. Each moth or butterfly species is summarised by how many distinct hostplants and hostplant families it has been recorded feeding on.

Usage

```
add_hosts(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Robinson et al. (2010) HOSTS, Natural History Museum, London (CC0). Lepidoptera only; ~24k species with at least one recorded hostplant.

Value

The same data.frame with additional columns:

host_plant_count Number of distinct hostplant species recorded.

host_family_count Number of distinct hostplant families recorded.

References

Robinson GS, Ackery PR, Kitching IJ, Beccaloni GW, Hernandez LM (2010) HOSTS - a Database of the World's Lepidopteran Hostplants. Natural History Museum, London. doi:10.5519/havt50xw

Examples

```
## Not run:
taxify("Papilio machaon", backbone = "gbif") |>
  add_hosts()

## End(Not run)
```

add_huang_amph	<i>Add amphibian morphometrics (Huang)</i>
----------------	--

Description

Joins species-level amphibian body measurements to a `taxify()` result by `accepted_name`. Only measurements comparable across Anura, Caudata and Gymnophiona are carried; per-specimen values are reduced to species medians.

Usage

```
add_huang_amph(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Huang amphibian morphological dataset (figshare, CC-BY 4.0).

Value

The same data.frame with numeric `huang_amph_svl_mm`, `huang_amph_head_length_mm`, `huang_amph_head_width_mm`, `huang_amph_eye_diameter_mm`, `huang_amph_forelimb_length_mm`, `huang_amph_hindlimb_length_mm` and categorical `huang_amph_taxon_order`.

References

Huang et al. A global amphibian morphological trait dataset. figshare. doi:10.6084/m9.figshare.21159229

Examples

```
## Not run:
taxify("Bufo bufo", backbone = "gbif") |>
  add_huang_amph()

## End(Not run)
```

add_hybrid_info	<i>Add hybrid parent and type information</i>
-----------------	---

Description

Parses the input_name column from a `taxify()` result to extract hybrid parent names and classify the hybrid type.

Usage

```
add_hybrid_info(x)
```

Arguments

`x` A data.frame returned by `taxify()`.

Value

The same data.frame with additional columns:

hybrid_parent_1 First parent (full binomial), NA if not a hybrid formula.

hybrid_parent_2 Second parent (full binomial, abbreviated or omitted genus expanded), NA if not a hybrid formula.

hybrid_parent_1_accepted, hybrid_parent_2_accepted The accepted name each parent resolves to against the backbone(s) used for `x` (from the result's metadata), or NA if the parent did not match.

hybrid_type One of "nothogenus", "nothospecies", "formula", or NA if not a hybrid (same value as the hybrid_type column already on a `taxify()` result).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus pyrenaica x Q. petraea") |>
  add_hybrid_info()

options(old)
```

add_invacost	<i>Add economic cost of biological invasions (InvaCost)</i>
--------------	---

Description

Joins per-species economic-cost aggregates from InvaCost (Diagne et al. 2020) to a `taxify()` result by looking up `accepted_name`. InvaCost's individual cost estimates are reduced to three per-species indicators; the raw estimate rows are not distributed.

Usage

```
add_invacost(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: InvaCost (Diagne et al. 2020, Scientific Data; database version 4.1, CC BY 4.0). Only the derived per-species aggregates are distributed here. For a rigorous cost analysis (temporal expansion, overlap handling, reliability filtering) use the `invacost` R package on the full database.

Value

The same data.frame with additional columns:

invacost_cost_total_usd Cumulative documented cost in 2017 USD: each estimate's standardised annual cost expanded across its documented impact period and summed over all of the species' estimates. Overlapping estimates are not de-duplicated, so this is a coarse economic-impact indicator, not an audited figure.

invacost_cost_n Number of cost estimates recorded for the species.

invacost_cost_type Cost type carrying the largest share of the species' cumulative cost: damage, management, mixed, or unspecified.

References

Diagne C et al. (2020) InvaCost, a public database of the economic costs of biological invasions worldwide. Scientific Data 7:277. doi:10.1038/s4159702000586z

Examples

```
## Not run:
taxify("Solenopsis invicta", backbone = "gbif") |>
  add_invacost()

## End(Not run)
```

add_italic	<i>Add Italian-lichen taxon-page traits (ITALIC)</i>
------------	--

Description

Joins per-species morphological and ecological descriptors from ITALIC, the Information System on Italian Lichens, to a `taxify()` result by looking up `accepted_name`. One row per species, scraped from the ITALIC 8.0 taxon pages.

Usage

```
add_italic(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: <code>NULL</code> (default) or <code>"all"</code> attaches every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default <code>TRUE</code> .

Details

Source: ITALIC 8.0 (Nimis; Univ. of Trieste), taxon-page descriptors, CC BY-SA 4.0. Lichens are otherwise almost absent from the bundled trait databases.

Value

The same data.frame with additional columns:

growth_form Thallus growth form (crustose, foliose, fruticose, ...).

substrata Substrata the species grows on.

photobiont Photosynthetic partner.

reproductive_strategy Reproductive strategy.

References

Nimis PL. ITALIC - The Information System on Italian Lichens, Version 8.0. University of Trieste, Dept. of Biology (<https://italic.units.it>), accessed 2026-07. System paper: Martellos S, Conti M, Nimis PL (2023) Aggregation of Italian Lichen Data in ITALIC 7.0. *Journal of Fungi* 9(5):556. doi:10.3390/jof9050556

Examples

```
## Not run:
taxify("Xanthoria parietina", backbone = "gbif") |>
  add_italic()

## End(Not run)
```

add_iucn	<i>Add IUCN Red List conservation status</i>
----------	--

Description

Joins IUCN Red List conservation status to a [taxify\(\)](#) result by looking up accepted_name. This is the source-named door for the IUCN Red List; for conservation status reconciled across sources, use [add_trait\(\)](#) once more than one source is registered for it.

Usage

```
add_iucn(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Show download progress if enrichment data needs to be fetched. Default TRUE.

Details

Conservation status values are compiled from publicly available sources including GBIF and the IUCN Red List API. Coverage is global across all taxonomic groups (~166k species).

Value

The same data.frame with an additional column:

conservation_status IUCN category: "LC" (Least Concern), "NT" (Near Threatened), "VU" (Vulnerable), "EN" (Endangered), "CR" (Critically Endangered), "EW" (Extinct in the Wild), "EX" (Extinct), or NA if not assessed.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Panthera tigris", backbone = "gbif") |>
  add_iucn()

options(old)
```

add_kew_cvalues	<i>Add plant genome size (Kew Plant DNA C-values)</i>
-----------------	---

Description

Joins plant genome-size data from the Kew Plant DNA C-values database (Pellicer & Leitch 2020) to a [taxify\(\)](#) result by looking up accepted_name. The 1C DNA amount is a per-species median. The chromosome number and ploidy level are the base cytotype, with the range across a species' cytotypes in the _min / _max columns.

Usage

```
add_kew_cvalues(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Kew Plant DNA C-values database, release 7.1 (Royal Botanic Gardens Kew), CC BY. Vascular plants.

Value

The same data.frame with additional columns. The default set:

cval_genome_size_1c_pg Genome size (1C DNA amount, picograms).

cval_chromosome_2n Somatic chromosome number (2n), base cytotype.

cval_ploidy_x Ploidy level, base cytotype.

cols = "all" also attaches the per-species min/max/n spread of each value, plus per-species provenance:

cval_original_reference The paper(s) the values were measured in, joined by "; " where a species carries records from several.

cval_estimation_method The method(s) used, in the source's codes: FC:PI and other FC: variants are flow cytometry with the named stain, Fe is Feulgen densitometry. The two are not interchangeable, so a species measured by both reports both.

References

Pellicer J, Leitch IJ (2020) The Plant DNA C-values database (release 7.1): an updated online repository of plant genome size data for comparative studies. *New Phytologist* 226:301-305.

Examples

```
## Not run:
# Downloads the enrichment on first use.
taxify("Zea mays", backbone = "gbif") |>
  add_kew_cvalues()

## End(Not run)
```

add_kew_sid	<i>Add seed traits from the Kew Seed Information Database (SER-SID)</i>
-------------	---

Description

Joins species-level seed traits from the Kew Seed Information Database (SER-SID) to a `taxify()` result by looking up `accepted_name`.

Usage

```
add_kew_sid(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Royal Botanic Gardens Kew, Seed Information Database, served as SER-SID (<https://ser-sid.org/>), CC BY 2.0. Per-record measurements are reduced to per-species medians (numeric) and modes (categorical); a thousand-seed weight in grams equals the per-seed mass in milligrams.

Value

The same data.frame with additional columns. The curated set:

sid_thousand_seed_weight Thousand-seed weight (grams per 1000 seeds, median of all records).

sid_storage_behaviour Seed storage behaviour (Orthodox/Recalcitrant/Intermediate/Uncertain).

sid_oil_content_pct Seed oil content (percent, median).

sid_protein_content_pct Seed protein content (percent, median).

sid_lifeform Raunkiaer life-form code as recorded by SID.

With cols = "all" the seed-weight record count (n_seed_weight_records) and modal fruit_type are also attached under their source names. Joined on accepted_name.

References

Royal Botanic Gardens Kew. Seed Information Database (SID). <https://ser-sid.org/>

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur", backbone = "gbif") |>
  add_kew_sid()

options(old)
```

add_leda

Add plant traits from LEDA Traitbase

Description

Joins LEDA Traitbase (Kleyer et al. 2008) plant functional traits to a `taxify()` result by looking up accepted_name. LEDA provides species-level trait data for NW European plant species, covering life form, dispersal, seed, leaf, and clonality traits.

Usage

```
add_leda(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: LEDA Traitbase (Kleyer et al. 2008). Coverage: ~8,000 NW European plant species.

The Raunkiaer life form is a bud-position classification system: phanerophyte = buds >25 cm above soil, chamaephyte = buds near soil surface, hemicryptophyte = buds at soil surface, geophyte (cryptophyte) = buds below soil, therophyte = annual that survives as seed.

Value

The same data.frame with additional columns:

raunkiaer_life_form Primary Raunkiaer life form classification (phanerophyte, chamaephyte, hemicryptophyte, geophyte, therophyte, helophyte, hydrophyte).

raunkiaer_variable 1 if species assigned to multiple Raunkiaer forms, 0 otherwise.

dispersal_type Primary dispersal type (anemochory, zoochory, hydrochory, autochory, barochory, dysochory).

terminal_velocity_ms Seed terminal velocity in m/s (species median).

seed_mass_mg Seed mass in mg (species median). Prefixed with leda_ in the .vtr to avoid collision with Diaz traits.

canopy_height_m Canopy height in meters (species median).

leaf_mass_mg Leaf dry mass in mg (species median).

sla_mm2_mg Specific leaf area in mm²/mg (species median).

clonal_growth Capable of clonal growth (1 = yes, 0 = no).

buoyancy Seed buoyancy classification.

References

Kleyer M et al. (2008) The LEDA Traitbase: a database of life-history traits of the Northwest European flora. *Journal of Ecology* 96:1266-1274.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Arrhenatherum elatius") |>
  add_leda()

options(old)
```

add_leptraits	<i>Add butterfly traits (LepTraits)</i>
---------------	---

Description

Joins LepTraits 1.0 butterfly life-history and ecological traits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_leptraits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: LepTraits 1.0 (Shirey et al. 2022, CC0). Coverage: ~12.4k butterfly species globally (Papilionoidea).

Value

The same data.frame with additional columns:

wingspan_mm Wingspan in mm (midpoint of lower and upper bounds).

voltinism Number of generations per year.

diapause_stage Overwintering/diapause life stage.

canopy_affinity Canopy association category.

edge_affinity Edge/gap affinity category.

moisture_affinity Moisture affinity category.

disturbance_affinity Disturbance affinity category.

n_hostplant_families Number of host plant families used.

flight_months Number of months with adult flight activity.

References

Shirey V et al. (2022) LepTraits 1.0: A globally comprehensive dataset of butterfly traits. Scientific Data 9:398.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Vanessa cardui", backbone = "gbif") |>
  add_leptraits()

options(old)
```

add_madin	<i>Add bacterial and archaeal traits (Madin et al.)</i>
-----------	---

Description

Joins species-level bacterial and archaeal phenotypic and genome traits to a `taxify()` result by looking up `accepted_name`.

Usage

```
add_madin(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Madin et al. (2020, Scientific Data, CC BY 4.0). Coverage: ~14.9k bacterial and archaeal species.

Value

The same data.frame with additional columns:

- madin_gram_stain** Gram stain (positive/negative).
- madin_metabolism** Metabolism (aerobic/anaerobic/facultative/...).
- madin_cell_shape** Cell shape (bacillus/coccus/spiral/...).
- madin_motility** Motility (yes/no/flagella/gliding/...).
- madin_sporulation** Sporulation (yes/no).
- madin_isolation_source** Isolation source category.
- madin_growth_temp_c** Recorded growth temperature (degrees Celsius).

madin_optimum_temp_c Optimum growth temperature (degrees Celsius).

madin_optimum_ph Optimum growth pH.

madin_genome_size_bp Genome size (base pairs).

madin_gc_content_pct Genomic G+C content (percent).

References

Madin JS et al. (2020) A synthesis of bacterial and archaeal phenotypic trait data. Scientific Data 7:170. doi:10.1038/s4159702004974

Examples

```
## Not run:
taxify("Escherichia coli", backbone = "gbif") |>
  add_madin()

## End(Not run)
```

add_nesttrait	<i>Add bird nest traits (NestTrait)</i>
---------------	---

Description

Joins bird nest-site, nest-structure and nest-attachment indicators to a `taxify()` result by accepted_name. Each trait is a 0/1 presence flag; a species may carry several flags within a group.

Usage

```
add_nesttrait(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: NestTrait v2 (Chia et al. 2023, Scientific Data, CC-BY 4.0).

Value

The same data.frame with three collapsed categorical columns (`nesttrait_structure`, `nesttrait_site`, `nesttrait_attachment`, each a pipe-delimited set of modalities for multi-modal species) plus 20 raw 0/1 indicator columns prefixed `nesttrait_`: `brood_parasite`, `mound_builder`, seven `nestsite_*`, seven `neststr_*` and four `nestatt_*` flags.

References

Chia SY et al. (2023) A global database of bird nest traits. Scientific Data. doi:10.1038/s41597-023028371

Examples

```
## Not run:
taxify("Turdus merula", backbone = "gbif") |>
  add_nesttrait()

## End(Not run)
```

add_nztd	<i>Add NZ marine benthos traits (NZTD)</i>
----------	--

Description

Joins New Zealand marine benthic-invertebrate functional traits to a `taxify()` result by `accepted_name`. Each fuzzy-coded trait is reduced to its dominant modality.

Usage

```
add_nztd(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: NZTD (Lam-Gordillo et al. 2023, figshare, CC-BY 4.0).

Value

The same data.frame with categorical `nztd_` columns: `bioturbation`, `body_size`, `degree_of_attachment`, `feeding_mode`, `living_habit`, `mobility`, `morphology`, `movement_method`, `rigidity`.

References

Lam-Gordillo O et al. (2023) New Zealand Trait Database (NZTD) for marine benthic invertebrates. figshare. doi:10.6084/m9.figshare.21939647

Examples

```
## Not run:
taxify("Macomona liliana", backbone = "gbif") |>
  add_nztd()

## End(Not run)
```

add_octocoral	<i>Add octocoral traits (Octocoral Trait Database)</i>
---------------	--

Description

Joins soft-coral (octocoral) colony, polyp, skeleton, symbiosis and feeding traits to a [taxify\(\)](#) result by accepted_name. Built from long-format records reduced to one value per species.

Usage

```
add_octocoral(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Octocoral Trait Database v2.2 (Gomez-Gras et al., CC-BY 4.0).

Value

The same data.frame with octocoral_ columns: numeric colony_height, colony_width, tentacles_per_polyp; categorical growth_form, type_of_growth, type_of_skeleton, polyp_retractability, polyp_dimorphism, zooxanthellate, axis_presence, feeding_mechanism, coloniality, skeletal_rigidity, calcareous_sclerites_pr

References

Octocoral Trait Database v2.2. Zenodo. [doi:10.5281/zenodo.14228404](https://doi.org/10.5281/zenodo.14228404)

Examples

```
## Not run:
taxify("Gorgonia ventalina", backbone = "gbif") |>
  add_octocoral()

## End(Not run)
```

add_odonata	<i>Add odonate behavioural/ecological traits (OPD)</i>
-------------	--

Description

Joins Odonate Phenotypic Database categorical traits to a `taxify()` result by `accepted_name` (modal value per species).

Usage

```
add_odonata(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Odonate Phenotypic Database (Waller et al., Dryad, CC-BY 4.0).

Value

The same data.frame with categorical `odonata_territoriality`, `odonata_flight_mode`, `odonata_mate_guarding`, `odonata_habitat_openness`, `odonata_has_wing_pigment`.

References

Waller JT et al. The Odonate Phenotypic Database. Dryad. [doi:10.5061/dryad.15pm5qc](https://doi.org/10.5061/dryad.15pm5qc)

Examples

```
## Not run:
taxify("Calopteryx splendens", backbone = "gbif") |>
  add_odonata()

## End(Not run)
```

add_pantheria	<i>Add mammal life-history traits (PanTHERIA)</i>
---------------	---

Description

Joins PanTHERIA mammal life-history and ecological traits to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_pantheria(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: PanTHERIA (Jones et al. 2009, Ecological Archives, CC0). Coverage: ~5.4k mammal species. Mammals only.

Value

The same data.frame with additional columns:

pantheria_body_mass_g Adult body mass in grams.

longevity_mo Maximum longevity in months.

litter_size Litter size (mean).

gestation_d Gestation length in days.

weaning_d Weaning age in days.

home_range_km2 Home range size in km².

diet_breadth Diet breadth (number of diet categories).

habitat_breadth Habitat breadth (number of habitat types).

References

Jones KE et al. (2009) PanTHERIA: a species-level database of life history, ecology, and geography of extant and recently extinct mammals. Ecology 90:2648.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Vulpes vulpes", backbone = "gbif") |>
  add_pantheria()

options(old)
```

add_parravicini	<i>Add reef-fish trophic guild (Parravicini)</i>
-----------------	--

Description

Joins the consensus reef-fish trophic-guild assignment to a `taxify()` result by `accepted_name`. The guild is the modal expert classification.

Usage

```
add_parravicini(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Parravicini et al. (2020) reef-fish trophic guilds (PLoS Biology, CC-BY 4.0).

Value

The same data.frame with categorical `parravicini_trophic_guild`.

References

Parravicini V et al. (2020) Delineating reef fish trophic guilds with global gut content data synthesis and phylogeny. PLoS Biology 18:e3000702. doi:[10.1371/journal.pbio.3000702](https://doi.org/10.1371/journal.pbio.3000702)

Examples

```
## Not run:
taxify("Zebrasoma scopas", backbone = "gbif") |>
  add_parravicini()

## End(Not run)
```

add_pelagic	<i>Add pelagic species traits</i>
-------------	-----------------------------------

Description

Joins pelagic fish/cephalopod/gelatinous traits to a `taxify()` result by accepted_name.

Usage

```
add_pelagic(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Gleiber et al. (2024) Pelagic Species Trait Database (Borealis, CC-BY 4.0).

Value

The same data.frame with pelagic_ columns: numeric depth_min_m, depth_max_m, temp_min_c, temp_max_c, temp_mean_c, length_min_tl_cm, length_max_tl_cm, trophic_level; categorical vert_habitat, horz_habitat, body_shape, phys_defense, gregarious.

References

Gleiber MR et al. (2024) A trait database for pelagic species. Scientific Data. doi:10.5683/SP3/0YFJED

Examples

```
## Not run:
taxify("Thunnus albacares", backbone = "gbif") |>
  add_pelagic()

## End(Not run)
```

add_phylacine	<i>Add mammal traits including extinct species (PHYLACINE)</i>
---------------	--

Description

Joins PHYLACINE mammal traits to a `taxify()` result by looking up `accepted_name`. PHYLACINE covers extant plus recently and prehistorically extinct mammals; it is offered alongside `add_pantheria()` and `add_combine()`, not as a replacement.

Usage

```
add_phylacine(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: PHYLACINE v1.2 (Faurby et al. 2018, Ecology, CC0). Coverage: ~5.8k mammal species including extinct taxa. `Mass.g` is partly modelled (PHYLACINE gap-fills data-poor and extinct species); `phylacine_mass_method / phylacine_mass_method_class` record how each mass was derived, so a modelled mass is not mistaken for a measurement where PHYLACINE is the only source.

Value

The same data.frame with additional columns:

- phylacine_mass_g** Body mass (g).
- phylacine_diet_plant_pct** Percent of diet that is plant.
- phylacine_diet_vertibrate_pct** Percent of diet that is vertebrate.
- phylacine_diet_invertebrate_pct** Percent of diet that is invertebrate.
- phylacine_terrestrial** Terrestrial habit (0/1).
- phylacine_marine** Marine habit (0/1).
- phylacine_freshwater** Freshwater habit (0/1).
- phylacine_aerial** Aerial habit (0/1).
- phylacine_island_endemicity** Island endemicity class.
- phylacine_iucn_status** IUCN status (includes EP = extinct in prehistory, EX, EW).
- phylacine_mass_method** How the body mass was obtained (the PHYLACINE `Mass.Method` field, verbatim): Reported, Imputed, or an allometric estimate (e.g. "Assumed isometric based on head-body length").

phylacine_mass_method_class Coarse provenance of the body mass: reported (measured/compiled), estimated (allometric or same-size analogy), or imputed (phylogenetic gap-fill). Only reported is an observation; the others are model estimates.

References

Faurby S et al. (2018) PHYLACINE 1.2: The Phylogenetic Atlas of Mammal Macroecology. Ecology 99:2626. doi:[10.1002/ecy.2443](https://doi.org/10.1002/ecy.2443)

Examples

```
## Not run:
taxify("Mammuthus primigenius", backbone = "gbif") |>
  add_phylacine()

## End(Not run)
```

add_pignatti

Add Italian plant traits from Pignatti (on demand, via TR8)

Description

Fetches Italian Ellenberg-type indicator values, life form, and chorotype from Pignatti's Flora d'Italia (Pignatti, Menegoni & Pietrosanti 2005) for the species in a `taxify()` result, using the TR8 package, and joins them by accepted_name. TR8 ships these values bundled, so this works offline.

Usage

```
add_pignatti(x, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
verbose	Logical. Default TRUE.

Details

These values originate in a copyrighted publication, so taxify does not redistribute them. This function reads the copy bundled in the suggested package TR8 (which redistributes it under TR8's GPL, with attribution); taxify ships none of it and no internet access is required. For European-calibration indicator values see `add_eive()`.

Value

The same data.frame with additional columns:

light_it, temperature_it, continentality_it, moisture_it, reaction_it, nutrients_it, salinity_it Ellenberg-type indicator values calibrated for the Italian flora (codes; X = indifferent, 0 = not applicable).

life_form_it Life form for the Italian flora.

chorotype_it Chorological type (distribution).

References

Pignatti S, Menegoni P, Pietrosanti S (2005) Bioindicazione attraverso le piante vascolari. Braun-Blanquetia 39. Bocci G (2015) TR8: an R package for easily retrieving plant species traits. Methods in Ecology and Evolution 6:347-350.

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

## Not run:
# add_pignatti() fetches Italian trait data on demand via the TR8 package.
taxify("Abies alba") |>
  add_pignatti()

## End(Not run)

options(old)
```

add_plantatt	<i>Add British and Irish plant attributes (PLANTATT)</i>
--------------	--

Description

Joins attributes of British and Irish vascular plants (Hill et al. 2004) to a [taxify\(\)](#) result by looking up accepted_name.

Usage

```
add_plantatt(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

1,887 taxa. For the German-flora equivalent see [add_floraweb\(\)](#), for the British Ecoflora traits [add_ecoflora\(\)](#), and for European-calibration indicator values [add_eive\(\)](#).

This source states no licence (it is copyright the Biological Records Centre), so taxify ships no pre-built copy of it. The first call builds it from the original source on your own machine, which requires the taxifydb package (`remotes::install_github("gcol33/taxifydb")`). taxify redistributes none of the data. Cite Hill et al. (2004) when you use it.

Value

The same data.frame with additional columns. The default set:

plantatt_ellenberg_light, **plantatt_ellenberg_moisture**, **plantatt_ellenberg_reaction**, **plantatt_ellenberg_nitrogen**, **plantatt_ellenberg_acidity**

Ellenberg indicator values calibrated for the British flora.

plantatt_max_height_cm Maximum height, cm.

plantatt_life_form Life-form code, kept verbatim (Ch, Ph, Gn, ...).

plantatt_woodiness Woodiness code, kept verbatim (w woody, h herbaceous, sw semi-woody).

plantatt_native_status Native-status code, kept verbatim (N native, AN alien naturalised, AR archaeophyte, ...).

References

Hill MO, Preston CD, Roy DB (2004) PLANTATT: Attributes of British and Irish Plants. Biological Records Centre, Centre for Ecology and Hydrology.

Examples

```
## Not run:
# Builds the enrichment on first use (needs taxifydb).
taxify("Bellis perennis", backbone = "gbif") |>
  add_plantatt()

## End(Not run)
```

add_pottier	<i>Add amphibian heat tolerance (Pottier)</i>
-------------	---

Description

Joins amphibian upper thermal-limit and body-size summaries to a [taxify\(\)](#) result by accepted_name. Per-measurement records are reduced to species medians; heat tolerance pools across metrics and acclimation conditions, so it is an approximate species-level upper thermal limit.

Usage

```
add_pottier(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Pottier et al. (2022) amphibian heat tolerance database (Scientific Data, CC-BY 4.0).

Value

The same data.frame with numeric columns `pottier_heat_tolerance_c`, `pottier_acclimation_temp_c`, `pottier_svl_mm`, `pottier_body_mass_g`.

References

Pottier P et al. (2022) A comprehensive database of amphibian heat tolerance. Scientific Data 9:600. doi:10.1038/s41597022017049

Examples

```
## Not run:
taxify("Rana temporaria", backbone = "gbif") |>
  add_pottier()

## End(Not run)
```

add_quimbayo	<i>Add reef-fish traits (Quimbayo)</i>
--------------	--

Description

Joins Atlantic and Eastern-Pacific reef-fish life-history, ecology and behaviour traits to a `taxify()` result by accepted_name.

Usage

```
add_quimbayo(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Quimbayo et al. (2021) reef-fish trait database (ESA data paper; Zenodo, open).

Value

The same data.frame with quimbayo_ columns: numeric body_size_max_cm, aspect_ratio, trophic_level, depth_min_m, depth_max_m, temp_occurrence_mean_c; categorical home_range, diel_activity, water_level, body_shape, mouth_position, diet, spawning, size_group.

References

Quimbayo JP et al. (2021) Life-history traits, geographical range, and conservation aspects of reef fishes. Ecology. doi:10.5281/zenodo.4455016

Examples

```
## Not run:
taxify("Thalassoma bifasciatum", backbone = "gbif") |>
  add_quimbayo()

## End(Not run)
```

add_ramond

Add marine protist functional traits (Ramond et al.)

Description

Joins genus-level morphological, behavioural and ecological traits of marine protists to a [taxify\(\)](#) result by looking up genus, so any species in a covered genus is annotated.

Usage

```
add_ramond(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Ramond et al. (SEANOE, CC BY 4.0), functional traits of marine protists. Traits are genus-level; numeric cell size is aggregated by median, categorical traits by mode.

Value

The same data.frame with additional columns. The curated set:

ramond_shape Cell shape (round, elongated, amoeboid, ...).

ramond_motility Motility mode (swimmer, floater, gliding, ...).

ramond_ingestion Ingestion / trophic mode (phagotrophic, ...).

ramond_chloroplast Chloroplast presence (1 = present).

ramond_symbiotic Symbiotic relationship (parasite, mutualist, ...).

ramond_colony Colony form.

ramond_salinity Salinity preference.

ramond_size_min_um Minimum cell size (micrometres).

ramond_size_max_um Maximum cell size (micrometres).

With `cols = "all"` the full set of behavioural, ecological and symbiosis descriptors is attached under their source names.

References

Ramond P, Siano R, Sourisseau M (2018) Functional traits of marine protists. SEANOE. doi:10.17882/51662

Examples

```
## Not run:
taxify("Alexandrium", backbone = "gbif") |>
  add_ramond()

## End(Not run)
```

add_repttraits

Add reptile ecological traits and distribution (ReptTraits)

Description

Joins species-level reptile traits from ReptTraits (Oskyrko et al. 2024) to a `taxify()` result by looking up `accepted_name`. ReptTraits is built on the Reptile Database taxonomy, so it joins cleanly against the `reptiledb` backbone (and any backbone that resolves to Reptile Database accepted names).

Usage

```
add_repttraits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

The layer carries a per-species distribution signal – biogeographic realm, elevation range and mean climate – alongside body-size and life-history traits, across all reptiles (snakes, lizards, amphisbaenians, turtles, crocodiles and the tuatara), not lizards only.

Source: ReptTraits v1.2 (Oskyrko et al. 2024, Scientific Data, CC BY 4.0). Coverage: 12,060 reptile species. The biogeographic realm and climate fields give a coarse, realm-level range signal; they are not a fine-grained (TDWG-level) range like the plant ranges used by the region constraint.

Value

The same data.frame with additional columns:

biogeographic_realm Main biogeographic realm (e.g. Neotropic, Palearctic, Afrotropic, Australo-Pacific, Marine).

microhabitat Microhabitat (e.g. Terrestrial, Saxicolous, Arboreal).

habitat_type Habitat type(s) (e.g. Forest, Desert, Wetlands).

elevation_min_m Minimum recorded elevation in metres.

elevation_max_m Maximum recorded elevation in metres.

mean_annual_temp_c Mean annual temperature across the range (degrees Celsius).

insular_endemic Whether the species is insular/endemic ("Yes"/"No").

body_mass_g Maximum body mass in grams.

svl_mm Maximum snout-vent length (straight carapace length for turtles) in mm.

total_length_mm Maximum total length in mm.

longevity_yr Maximum longevity in years.

diet Diet category (e.g. Carnivorous, Herbivorous, Omnivorous).

reproductive_mode Reproductive mode (oviparous/viviparous/...).

clutch_size Mean clutch or litter size.

active_time Activity time (Diurnal/Nocturnal/Cathemeral).

foraging_mode Foraging mode (ACT active / AMB ambush / Mixed).

References

Oskyrko O, Mi C, Meiri S, Du W (2024) ReptTraits: a comprehensive dataset of ecological traits in reptiles. Scientific Data 11:243. doi:10.1038/s41597024030795

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Pogona vitticeps", backbone = "reptiledb") |>
  add_repttraits()

options(old)
```

add_rimet_phyto	<i>Add phytoplankton cell metrics (Rimet & Druart)</i>
-----------------	--

Description

Joins cell-level morphometrics for temperate-lake phytoplankton to a `taxify()` result by `accepted_name`.

Usage

```
add_rimet_phyto(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Rimet & Druart (2018) phytoplankton metrics database (Zenodo, CC-BY 4.0).

Value

The same data.frame with numeric columns `rimet_phyto_cell_length_um`, `rimet_phyto_cell_width_um`, `rimet_phyto_cell_thickness_um`, `rimet_phyto_cell_surface_area_um2`, `rimet_phyto_cell_biovolume_um3`.

References

Rimet F, Druart JC (2018) A trait database for phytoplankton of temperate lakes. Zenodo. [doi:10.5281/zenodo.1164834](https://doi.org/10.5281/zenodo.1164834)

Examples

```
## Not run:
taxify("Asterionella formosa", backbone = "gbif") |>
  add_rimet_phyto()

## End(Not run)
```

add_saproxylic	<i>Add saproxylic beetle morphology (Hagge)</i>
----------------	---

Description

Joins European deadwood-beetle body and appendage morphometrics to a `taxify()` result by `accepted_name`.

Usage

```
add_saproxylic(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Hagge et al. (2021) saproxylic beetle morphology (Dryad, CC0).

Value

The same data.frame with numeric saproxylic_ columns: `body_length_mm`, `body_width_mm`, `body_height_mm`, `mass_mg`, `colour_lightness`, `head_length_mm`, `pronotum_length_mm`, `elytra_length_mm`, `wing_length_mm`, `wing_aspect`, `antenna_length_mm`, `eye_length_mm`.

References

Hagge J et al. (2021) Morphological trait database of European saproxylic beetles. Dryad. [doi:10.5061/dryad.2fqz612p3](https://doi.org/10.5061/dryad.2fqz612p3)

Examples

```
## Not run:
taxify("Rhysodes sulcatus", backbone = "gbif") |>
  add_saproxylic()

## End(Not run)
```

add_sealifebase	<i>Add aquatic-life traits (SeaLifeBase)</i>
-----------------	--

Description

Joins SeaLifeBase morphological and ecological traits to a `taxify()` result by looking up `accepted_name`. SeaLifeBase is the non-fish companion to FishBase: molluscs, crustaceans, echinoderms, marine mammals, reptiles and other aquatic organisms. For fishes, use `add_fishbase()`.

Usage

```
add_sealifebase(x, cols = NULL, verbose = TRUE)
```

Arguments

- `x` A data.frame returned by `taxify()`.
- `cols` Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See `enrichment_cols`.
- `verbose` Logical. Default TRUE.

Details

Source: SeaLifeBase via rfishbase (Palomares & Pauly, CC BY-NC 4.0). Non-fish aquatic life only. The build-from-source fallback requires the **rfishbase** package (available on CRAN). Pre-built .vtr files do not require rfishbase.

Value

- The same data.frame with additional columns:
- sb_body_length_cm** Maximum body length in centimetres.
 - sb_body_mass_g** Body mass in grams where available.
 - sb_trophic_level** Trophic level.
 - sb_depth_min_m** Minimum depth in metres.
 - sb_depth_max_m** Maximum depth in metres.
 - sb_vulnerability** Vulnerability index (0–100).
 - sb_habitat** Habitat type (e.g. benthic, pelagic).
 - sb_importance** Commercial importance category.

References

Palomares MLD, Pauly D (eds.) (2024) SeaLifeBase. World Wide Web electronic publication, <https://www.sealifebase.org>.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Octopus vulgaris", backbone = "gbif") |>
  add_sealifebase()

options(old)
```

add_sharkipedia	<i>Add elasmobranch life-history traits (Sharkipedia)</i>
-----------------	---

Description

Joins Sharkipedia shark and ray life-history traits to a [taxify\(\)](#) result by accepted_name. Long-format observations are reduced to one value per species (numeric traits by median) at build time.

Usage

```
add_sharkipedia(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Sharkipedia (Mull et al. 2022, Scientific Data, CC-BY 4.0).

Value

The same data.frame with additional columns:

sharkipedia_lmax_cm Maximum observed length (cm).
sharkipedia_vbgf_linf_cm von Bertalanffy asymptotic length Linf (cm).
sharkipedia_vbgf_k von Bertalanffy growth coefficient k (per year).
sharkipedia_vbgf_t0 von Bertalanffy t0 (years).
sharkipedia_length_first_maturity_cm Length at first maturity (cm).
sharkipedia_length_birth_cm Length at birth (cm).
sharkipedia_amax_observed_yr Maximum observed age (years).
sharkipedia_age_first_maturity_yr Age at first maturity (years).
sharkipedia_uterine_fecundity Uterine fecundity.
sharkipedia_gestation_length Gestation length.
sharkipedia_natural_mortality Natural mortality M.

References

Mull CG et al. (2022) Sharkipedia: a curated open access database of shark and ray life history traits and abundance time-series. Scientific Data 9:559. doi:10.1038/s41597022016551

Examples

```
## Not run:
taxify("Carcharodon carcharias", backbone = "gbif") |>
  add_sharkipedia()

## End(Not run)
```

add_sheld	<i>Add freshwater mussel traits (SHELD)</i>
-----------	---

Description

Joins US freshwater-mussel life-history and host traits to a [taxify\(\)](#) result by accepted_name.

Usage

```
add_sheld(x, cols = NULL, verbose = TRUE)
```

Arguments

- x A data.frame returned by [taxify\(\)](#).
- cols Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See [enrichment_cols](#).
- verbose Logical. Default TRUE.

Details

Source: SHELD (Hopper et al. 2023, Scientific Data, CC-BY 4.0).

Value

The same data.frame with sheld_ columns: numeric mean_length_mm, max_length_mm, mature_age, max_age, growth_rate, fecundity, n_host_species, n_host_family; categorical brood, marsupial_gills, hermaphrodite, shell_sculpture.

References

Hopper GW et al. (2023) A trait dataset for freshwater mussels of the United States of America. Scientific Data 10:745. doi:10.1038/s41597023026359

Examples

```
## Not run:
taxify("Lampsilis cardium", backbone = "gbif") |>
  add_sheld()

## End(Not run)
```

add_spider_traits	<i>Add spider traits (World Spider Trait Database)</i>
-------------------	--

Description

Joins species-level spider morphometric and ecological traits to a [taxify\(\)](#) result by looking up accepted_name. Values are aggregated from the World Spider Trait Database (numeric traits by median, categorical traits by mode); access-restricted source records are excluded.

Usage

```
add_spider_traits(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: World Spider Trait Database (Pekar et al. 2021, Database, CC BY 4.0). Coverage: ~7.3k spider species. Morphometry is sexually dimorphic in spiders; the value here is the across-record median and is not split by sex.

Value

The same data.frame with additional columns:

spider_body_length_mm Body length (mm).
spider_prosoma_length_mm Cephalothorax (prosoma) length (mm).
spider_prosoma_width_mm Cephalothorax (prosoma) width (mm).
spider_abdomen_length_mm Abdomen (opisthosoma) length (mm).
spider_leg1_length_mm Leg I length (mm).
spider_ballooning Ballooning (aerial dispersal): yes/no.
spider_web_building Web building: yes/no.

spider_hunting_guild Hunting guild.
spider_web_type Web type.
spider_circadian_activity Circadian activity (diurnal/nocturnal).
spider_stratum Vertical stratum (habitat layer).

References

Pekar S et al. (2021) The World Spider Trait database: a centralized global open repository for curated data on spider traits. Database 2021:baab064. doi:[10.1093/database/baab064](https://doi.org/10.1093/database/baab064)

Examples

```
## Not run:
taxify("Araneus diadematus", backbone = "gbif") |>
  add_spider_traits()

## End(Not run)
```

add_tetradensity	<i>Add population density (TetraDENSITY)</i>
------------------	--

Description

Joins species-median terrestrial-vertebrate population density to a `taxify()` result by accepted_name. Only ind/km2 records are used.

Usage

```
add_tetradensity(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Santini et al. TetraDENSITY (figshare, CC-BY 4.0). Records in other density units are excluded to avoid mixing.

Value

The same data.frame with numeric tetradensity_density_ind_km2.

References

Santini L et al. TetraDENSITY: a database of population density estimates in terrestrial vertebrates. figshare. doi:[10.6084/m9.figshare.5371633](https://doi.org/10.6084/m9.figshare.5371633)

Examples

```
## Not run:
taxify("Capreolus capreolus", backbone = "gbif") |>
  add_tetradensity()

## End(Not run)
```

add_thermofresh	<i>Add freshwater thermal-tolerance traits (ThermoFresh)</i>
-----------------	--

Description

Joins species-level critical thermal limits for freshwater fish, invertebrates and amphibians to a [taxify\(\)](#) result by looking up accepted_name. All values are in degrees Celsius.

Usage

```
add_thermofresh(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: the Freshwater thermal-tolerance database (Helena Bayat and contributors, Zenodo, CC BY 4.0). Each source record is one tolerance test; values are reduced to species-level medians per metric.

Value

The same data.frame with additional columns:

thermofresh_ctmax Critical thermal maximum (degrees C).
thermofresh_ctmin Critical thermal minimum (degrees C).
thermofresh_lt50 Median lethal temperature (degrees C).
thermofresh_ltmax Lethal thermal maximum (degrees C).
thermofresh_ltmin Lethal thermal minimum (degrees C).

References

Freshwater thermal-tolerance database. Zenodo. [doi:10.5281/zenodo.14056760](https://doi.org/10.5281/zenodo.14056760)

Examples

```
## Not run:
taxify("Salmo trutta", backbone = "gbif") |>
  add_thermofresh()

## End(Not run)
```

add_trait	<i>Add a trait from every source that carries it</i>
-----------	--

Description

Attaches a single harmonized trait (e.g. woodiness, plant height) to a `taxify()` result, pulling from every enrichment source that provides it and reconciling their differing vocabularies and units. Where the per-source `add_*`() doors each join one dataset, `add_trait()` is the cross-source verb: you name the trait, it gathers the sources.

Usage

```
add_trait(
  x,
  trait,
  sources = "all",
  mode = c("coalesce", "wide"),
  combine = NULL,
  priority = NULL,
  verbose = TRUE
)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
trait	Character. A single trait name; see <code>list_traits()</code> for the available traits and <code>trait_info()</code> for a trait's sources and units.
sources	Which sources to use. Either the string "all" (the default) for every source registered for the trait, or a character vector of source names (see <code>trait_info()</code>).
mode	One of "coalesce" (default) or "wide". "coalesce" reduces the sources to one value per row (see <code>combine</code>). "wide" attaches one harmonized column per source.

combine	How mode = "coalesce" reduces the per-source values for a row. NULL (default) is method-aware: when the trait's sources agree in method it uses "median" for numeric traits and "first" for categorical traits; when sources measure the trait differently (a source carries a caution, e.g. maximum vs fine-root diameter) it uses "complete" instead of blending them. Numeric options: "median", "mean", "first" (highest-priority source that has a value), "min", "max", "complete" (the single most populated source, reported verbatim). Categorical options: "first", "vote" (majority across sources, ties broken by priority), or "complete". Median is the numeric default for concordant sources because trait values are skewed, so a single outlier should not decide the value; "complete" is the default for discordant sources because a median across methods matches no method. Passing combine explicitly overrides this and is applied to all sources.
priority	Character vector of source names giving the priority order (highest priority first), used by combine = "first", for tie-breaking combine = "vote", and to break ties in combine = "complete". Only used when mode = "coalesce"; defaults to the registered order for the trait (see trait_info()).
verbose	Logical. Default TRUE.

Details

Each source keeps its provenance. The default "coalesce" mode reduces the sources to one value per row plus the columns that document it – its unit, the sources that contributed, how many, and a caution when the sources measure the trait by different methods. The opt-in "wide" mode instead gives every source its own column (<trait>_<source>), so per-source agreement and conflict stay fully visible.

Harmonization is per source: a categorical source is mapped to the trait's shared vocabulary, and a numeric source is converted to the trait's canonical unit. For example, GIFT seed mass (grams) and Diaz et al. seed mass (milligrams) both arrive as milligrams. The mappings and units for a trait are listed by [trait_info\(\)](#).

Some sources report the same trait in the right unit but under a different definition (for example AusTraits root diameter is a maximum including coarse roots, while GRooT is fine-root only). Such a source carries a caution in the registry. In mode = "coalesce" with the default combine, a trait whose sources disagree in method is not blended: the most complete source is reported and <trait>_caution records the difference. [trait_info\(\)](#) lists each source's harmonization note and caution.

A source enrichment that is not installed and cannot be downloaded or built is skipped with a warning, and the trait is assembled from the sources that are available.

Value

The same data.frame with added columns.

mode = "coalesce" <trait> (the reduced value); <trait>_unit (the canonical unit, numeric traits only); <trait>_sources (the source it came from, or the comma-separated contributing sources with an aggregating combine); <trait>_n (how many sources backed the value); for numeric traits, <trait>_min and <trait>_max (the range of values behind the headline – across the contributing sources, and across a source's own records where that spread was recorded at build time, so a life-stage or population span stays visible); and, only when a

source measured the trait differently, `<trait>_caution` explaining the method difference. To inspect every source, use `mode = "wide"`.

`mode = "wide"` One column per source, `<trait>_<source>`, each harmonized to the trait's shared vocabulary (categorical) or unit (numeric); `<trait>_unit`; and `<trait>_caution` on rows where a cautioned source supplied a value.

Numeric traits are returned in the trait's canonical unit (see `trait_info()`); rows absent from a source get NA.

See Also

`list_traits()` to see available traits, `trait_info()` for a trait's sources and units. The per-source doors (`add_zanne()`, `add_gift()`, `add_diaz_traits()`, `add_leda()`) join one dataset each.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# One coalesced value plus its provenance (unit, sources, count):
taxify("Abies alba") |>
  add_trait("seed_mass")

# One column per source, to inspect agreement and conflict:
taxify("Abies alba") |>
  add_trait("woodiness", mode = "wide")

options(old)
```

add_tree_of_sex	Add sex-determination traits (Tree of Sex)
-----------------	--

Description

Joins sexual-system and sex-determination traits to a `taxify()` result by looking up `accepted_name`. Covers plants, vertebrates and invertebrates; some traits are group-specific (selfing for plants, environmental sex determination for vertebrates, haplodiploidy for invertebrates).

Usage

```
add_tree_of_sex(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Tree of Sex (Tree of Sex Consortium 2014, Scientific Data, CC0). Coverage: ~37.5k species across plants, vertebrates and invertebrates.

Value

The same data.frame with additional columns:

tos_taxon_group Source group (plants/vertebrates/invertebrates).

tos_sexual_system Sexual system (vocabulary differs by group).

tos_karyotype Sex-chromosome system (XY/ZW/XO/homomorphic/...).

tos_genotypic Heterogamety (male/female heterogametic/GSD/...).

tos_molecular_basis Molecular basis (Y dominant/W dominant/dosage).

tos_selfing Selfing (plants; self compatible/incompatible).

tos_environmental_sd Environmental sex determination (vertebrates; TSD/...).

tos_haplodiploidy Haplodiploidy (invertebrates).

References

The Tree of Sex Consortium (2014) Tree of Sex: a database of sexual systems. Scientific Data 1:140015. doi:[10.1038/sdata.2014.15](https://doi.org/10.1038/sdata.2014.15)

Examples

```
## Not run:
taxify("Silene latifolia", backbone = "gbif") |>
  add_tree_of_sex()

## End(Not run)
```

add_usda_fungus_host *Add fungal host breadth (USDA Fungus-Host Dataset)*

Description

Joins per-fungus host breadth from the USDA National Fungus Collections Fungus-Host Dataset to a `taxify()` result by looking up `accepted_name`. Each fungus species is summarised by how many distinct host plants and host plant genera it has been recorded on.

Usage

```
add_usda_fungus_host(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
verbose	Logical. Default TRUE.

Details

Source: Farr, Rossman & Castlebury (2021) United States National Fungus Collections Fungus-Host Dataset, Ag Data Commons (U.S. Public Domain). Fungi only; ~99k species with at least one recorded host.

Value

The same data.frame with additional columns:

fungus_host_count Number of distinct host plant species recorded.

fungus_host_genus_count Number of distinct host plant genera recorded.

References

Farr DF, Rossman AY, Castlebury LA (2021) United States National Fungus Collections Fungus-Host Dataset. Ag Data Commons. doi:10.15482/USDA.ADC/1524414

Examples

```
## Not run:
taxify("Puccinia graminis", backbone = "gbif") |>
  add_usda_fungus_host()

## End(Not run)
```

add_useful_plants	<i>Add human-use categories (World Checklist of Useful Plant Species)</i>
-------------------	---

Description

Joins plant human-use categories to a `taxify()` result by looking up `accepted_name`. Each of the ten Level-1 use categories is a 0/1 flag, plus a crop-wild-relative flag.

Usage

```
add_useful_plants(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by <code>taxify()</code> .
cols	Character vector of use-category columns to attach, or "all". NULL (default) attaches all eleven. See <code>enrichment_cols()</code> .
verbose	Logical. Default TRUE.

Details

Source: World Checklist of Useful Plant Species (Diazgranados et al. 2020, KNB, CC BY 4.0).
Coverage: ~39k plant species.

Value

The same data.frame with additional columns:

useful_animal_food Animal food (0/1).
useful_environmental_uses Environmental uses (0/1).
useful_fuels Fuels (0/1).
useful_gene_sources Gene sources (0/1).
useful_human_food Human food (0/1).
useful_invertebrate_food Invertebrate food (0/1).
useful_materials Materials (0/1).
useful_medicines Medicines (0/1).
useful_poisons Poisons (0/1).
useful_social_uses Social uses (0/1).
useful_crop_wild_relative Crop wild relative (0/1).

References

Diazgranados M et al. (2020) World Checklist of Useful Plant Species. Knowledge Network for Biocomplexity. doi:10.5063/F1CV4G34

Examples

```
## Not run:  
taxify("Acorus calamus", backbone = "gbif") |>  
  add_useful_plants()  
  
## End(Not run)
```

add_wcvp	<i>Add WCVP native range status</i>
----------	-------------------------------------

Description

Joins WCVP (World Checklist of Vascular Plants, Kew) native range data to a `taxify()` result, filtered by TDWG botanical region.

Usage

```
add_wcvp(x, region, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>region</code>	Character. TDWG Level 3 region code(s), or "all". See <code>taxify_regions()</code> for the full list of codes. • Single code (e.g., "BGM" for Belgium): adds <code>native_status</code> column (no suffix). • Multiple codes (e.g., <code>c("BGM", "GER")</code>): adds <code>native_status_BGM</code>, <code>native_status_GER</code>. • "all": adds one column per region in the dataset.
<code>cols</code>	List the region codes WCVP covers with <code>enrichment_groups("wcvp")</code> . Which columns to attach. NULL (the default) attaches the curated set; a character vector of column names attaches just those, and "all" attaches every column the source carries (see <code>enrichment_cols()</code>).
<code>verbose</code>	Logical. Default TRUE.

Details

Source: WCVP (Kew, CC BY). Coverage: ~340k plant species. Plants only.

Value

The same data.frame with additional column(s):

native_status One of "native", "introduced", "extinct", or NA if not recorded for that region.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur") |>
  add_wcvp(region = "EUR")

taxify("Quercus robur") |>
  add_wcvp(region = c("EUR", "NAM"))
```

```
options(old)
```

add_wfo_info	<i>Add WFO-specific columns</i>
--------------	---------------------------------

Description

Joins extra World Flora Online columns to a `taxify()` result by looking up `taxon_id` in the WFO backbone.

Usage

```
add_wfo_info(x)
```

Arguments

`x` A data.frame returned by `taxify()` with `backbone == "wfo"`.

Value

The same data.frame with additional columns:

scientificNameID WFO scientificNameID.

parentNameUsageID WFO parentNameUsageID.

namePublishedIn Publication reference.

higherClassification Higher classification string.

taxonRemarks Taxonomic remarks.

infraspecificEpithet Infraspecific epithet (for subspecies, varieties, forms).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur") |>
  add_wfo_info()

options(old)
```

add_zanne	<i>Add woodiness (Zanne et al. 2014)</i>
-----------	--

Description

Joins the woody / herbaceous classification of Zanne et al. (2014) to a [taxify\(\)](#) result by looking up accepted_name. This is the source-named door for the Zanne Global Woodiness Database; for woodiness reconciled across every source that carries it (Zanne, GIFT), use [add_trait\(\)](#) with "woodiness".

Usage

```
add_zanne(x, cols = NULL, verbose = TRUE)
```

Arguments

x	A data.frame returned by taxify() .
cols	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See enrichment_cols .
verbose	Logical. Default TRUE.

Details

Source: Zanne et al. 2014, Nature (Dryad, CC0). Coverage: ~50k plant species. Plants only.

Value

The same data.frame with an additional column:

woodiness One of "woody", "herbaceous", "variable", or NA if not in the dataset.

References

Zanne AE et al. (2014) Three keys to the radiation of angiosperms into freezing environments. Nature 506:89-92.

See Also

[add_trait\(\)](#) for woodiness harmonized across sources.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

taxify("Quercus robur") |>
  add_zanne()
```

```
options(old)
```

add_zooplankton	<i>Add marine zooplankton traits</i>
-----------------	--------------------------------------

Description

Joins global marine-zooplankton traits to a `taxify()` result by `accepted_name` (species-level summaries).

Usage

```
add_zooplankton(x, cols = NULL, verbose = TRUE)
```

Arguments

<code>x</code>	A data.frame returned by <code>taxify()</code> .
<code>cols</code>	Which columns to attach: NULL (default) the curated set, "all" every column the source carries, or a character vector of names. See <code>enrichment_cols</code> .
<code>verbose</code>	Logical. Default TRUE.

Details

Source: Pata & Hunt global marine zooplankton trait database (Zenodo, CC-BY-SA 4.0).

Value

The same data.frame with zooplankton_ columns: numeric `body_length_max_mm`, `carbon_weight_mg`, `nitrogen_pdw_pct`; categorical `vertical_distribution`, `reproduction_mode`, `trophic_group`, `feeding_mode`, `myelination`, `habitat_association`, `diel_vertical_migration`, `bioluminescence`.

References

Pata PR, Hunt BPV (2025) A global trait database for marine zooplankton. Zenodo. [doi:10.5281/zenodo.8102913](https://doi.org/10.5281/zenodo.8102913)

Examples

```
## Not run:
taxify("Calanus finmarchicus", backbone = "gbif") |>
  add_zooplankton()

## End(Not run)
```

children

List the accepted taxa within a genus or family

Description

Returns the accepted taxa a backbone places inside a genus or family, so you can build a checklist from the backbone rather than only validating one. The parent is auto-detected: a genus is tried first, then a family.

Usage

```
children(taxon, backbone = NULL, rank = "species", verbose = TRUE)
```

Arguments

taxon	A single genus or family name.
backbone	A single backbone name (e.g. "wfo") or a <code>taxify_backend</code> object. NULL (default) uses the highest-priority installed backbone.
rank	Rank of the children to return ("species" by default), or "any" for every rank below the parent.
verbose	Logical. Default TRUE.

Value

A `data.frame` of accepted taxa, columns: name, authorship, rank, family, genus, taxon_id, parent_rank ("genus" or "family"), backbone. Empty if the parent is not found.

See Also

[synonyms\(\)](#), [taxify\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

children("Quercus", backbone = "wfo")

options(old)
```

cite	<i>Cite data sources used in a taxify result</i>
------	--

Description

Prints formatted citations for the taxonomic backbone(s), enrichment layers, and the taxify package itself. Optionally writes a BibTeX file.

Usage

```
cite(x, file = NULL)
```

Arguments

x	A <code>taxify_result</code> object.
file	Optional file path. If provided, BibTeX entries are written to this file (extension should be <code>.bib</code>).

Value

x, invisibly (pipe-friendly).

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

result <- taxify("Quercus robur", backbone = "wfo")
result |> cite()
result |> cite(file = tempfile(fileext = ".bib"))

options(old)
```

class2tree	<i>Build a taxonomy tree from resolved names</i>
------------	--

Description

Resolves the names, attaches their full higher classification, and assembles a taxonomy tree (kingdom -> phylum -> class -> order -> family -> genus -> species) from the shared lineages. Returns the tree as a Newick string and the underlying classification table; when the **ape** package is installed, an `ape phylo` object is included too.

Usage

```
class2tree(x, backbone = NULL, verbose = TRUE)

## S3 method for class 'taxify_tree'
print(x, ...)
```

Arguments

<code>x</code>	Character vector of names, or a taxify() result.
<code>backbone</code>	Backend passed to taxify() when <code>x</code> is raw names. <code>NULL</code> (default) uses every installed backbone. Ignored when <code>x</code> is a result.
<code>verbose</code>	Logical. Default <code>TRUE</code> .
<code>...</code>	Ignored, present for S3 print method consistency.

Value

An object of class `taxify_tree`: a list with

newick The Newick string (internal nodes labelled by rank value, tips by species name).

classification The classification data.frame the tree was built from.

tip_labels The species at the tips.

phylo An `ape` phylo object, or `NULL` if `ape` is not installed / the string could not be parsed.

See Also

[lowest_common\(\)](#), [add_classification\(\)](#), [taxify\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

tr <- class2tree(c("Quercus robur", "Quercus petraea", "Quercus pyrenaica"))
tr$newick

options(old)
```

Description

The reverse of [add_common_names\(\)](#): given a common name, return the accepted scientific name(s) it refers to. Reads the bundled `common_names` enrichment (GBIF, NCBI, and Open Tree vernaculars) offline; the first call may trigger the one-time download. A common name is frequently ambiguous (several species share "bluebell", "robin"), so the result can carry more than one row per query.

Usage

```
comm2sci(x, lang = NULL, resolve = FALSE, backbone = NULL, verbose = TRUE)
```

Arguments

x	Character vector of common names.
lang	Character. Restrict to one language: an ISO 639-1 code ("en", "de", ...) as used by the GBIF source, or NA for the untagged NCBI/Open Tree names. NULL (default) searches every language. List the languages present with <code>enrichment_groups("common_names")</code> .
resolve	Logical. When FALSE (default), return the lookup table (common name -> scientific name). When TRUE, run the matched scientific names through <code>taxify()</code> and return a <code>taxify_result</code> (with a leading <code>query_common</code> column), so the result pipes straight into the <code>add_*</code> () enrichments.
backbone	Passed to <code>taxify()</code> when <code>resolve = TRUE</code> ; NULL (default) uses every installed backbone. Ignored when <code>resolve = FALSE</code> .
verbose	Logical. Default TRUE.

Value

When `resolve = FALSE`, a data.frame with one row per (query, scientific match):

input_name The common name as supplied.

common_name The vernacular name as stored in the source (its casing, which may differ from `input_name`).

accepted_name The accepted scientific name.

lang Language tag of the vernacular name (NA for NCBI/Open Tree).

A query with no match contributes no rows. When `resolve = TRUE`, a `taxify_result` for the distinct matched scientific names, with `query_common` prepended.

See Also

`add_common_names()` for the forward direction (scientific -> common), `taxify()`.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# The bundled example database maps "example_common_name" to Quercus robur;
# against the full download this is where "pedunculate oak" would resolve.
comm2sci("example_common_name")

# Resolve straight to a taxify_result you can enrich
comm2sci("example_common_name", resolve = TRUE, backbone = "wfo")

options(old)
```

downstream

List all descendants of a taxon down to a target rank

Description

Returns every accepted taxon at `downto` rank that sits beneath `taxon` – for example every species in an order or family. The parent's rank is detected from the backbone, then descendants are read from the denormalized classification the backbone stores. Where `children()` gives the immediate contents of a genus or family, `downstream()` reaches an arbitrary depth.

Usage

```
downstream(taxon, backbone = NULL, downto = "species", verbose = TRUE)
```

Arguments

<code>taxon</code>	A single higher-taxon name (a genus, family, order, class, phylum, or kingdom).
<code>backbone</code>	A single backbone name or a <code>taxify_backend</code> object. <code>NULL</code> (default) uses the highest-priority installed backbone; name one that stores the higher ranks (e.g. "col") to reach above genus.
<code>downto</code>	Target rank of the descendants to return ("species" by default), or "any" for every accepted taxon beneath <code>taxon</code> regardless of rank.
<code>verbose</code>	Logical. Default <code>TRUE</code> .

Value

A data.frame of accepted descendants, columns: `name`, `authorship`, `rank`, `family`, `genus`, `taxon_id`, `parent`, `parent_rank`, `backbone`. Empty when `taxon` is not found, its rank is one the backbone does not store as a column (e.g. subfamily, tribe), or it has no descendants at `downto`.

See Also

`children()` for the immediate level, `taxify()`, `synonyms()`.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Every species the backbone places in the genus
downstream("Quercus", backbone = "col")

options(old)
```

enrichment_cols	<i>Browse the trait columns an enrichment door can attach</i>
-----------------	---

Description

Lists the columns available from an enrichment's pre-built `.vtr`, so you can choose which to attach through the doors that accept a `cols` argument (such as `add_gift()` and `add_floraweb()`). Read offline from the local `.vtr`; the first call may trigger the one-time download.

Usage

```
enrichment_cols(source)
```

Arguments

`source` Character. An enrichment name (see `list_enrichments()`).

Value

A data.frame with one row per column: `column` (the name) and `type` ("numeric" or "character").

See Also

`add_gift()`, `add_floraweb()`, `list_enrichments()`

Examples

```
old <- options(taxify.data_dir = taxify_example_data())
enrichment_cols("gift")
options(old)
```

enrichment_groups	<i>Browse the group values a grouped enrichment can filter on</i>
-------------------	---

Description

Some enrichment doors attach data per group: GRIIS invasive status by country (`add_griis()`), WCVF native ranges by TDWG region (`add_wcvf()`), vernacular names by language (`add_common_names()`), alien first records by country (`add_alien_first_records()`). This lists the valid group values for such a door, the way `enrichment_cols()` lists a door's columns, so a country, region, or language code need not be guessed. Read offline from the local `.vtr` metadata (falling back to the manifest, then a scan of the `.vtr`); the first call may trigger the one-time download.

Usage

```
enrichment_groups(source, verbose = TRUE)
```

Arguments

- source Character. A grouped enrichment name (see [list_enrichments\(\)](#)).
- verbose Logical. Print the group column and count. Default TRUE.

Value

A character vector of the available group values, sorted. Stops with a pointer to [enrichment_cols\(\)](#) when source is a flat (non-grouped) enrichment, which has no group values.

See Also

[enrichment_cols\(\)](#), [list_enrichments\(\)](#), [add_griis\(\)](#), [add_wcvp\(\)](#), [add_common_names\(\)](#), [add_alien_first_records\(\)](#)

Examples

```
old <- options(taxify.data_dir = taxify_example_data())
enrichment_groups("griis") # ISO country codes GRIIS covers
options(old)
```

export_data	<i>Export a taxify result to file</i>
-------------	---------------------------------------

Description

Writes a [taxify\(\)](#) result (with any enrichments) to disk in one of several formats. The default .vtr format preserves column types and is fast to re-read with [add_data\(\)](#).

Usage

```
export_data(x, path, overwrite = FALSE)
```

Arguments

- x A data.frame returned by [taxify\(\)](#).
- path Character. Output file path. The format is inferred from the extension: .vtr, .csv, .tsv, or .xlsx.
- overwrite Logical. Overwrite an existing file? Default FALSE.

Value

Invisibly returns path.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

result <- taxify(c("Quercus robur", "Pinus sylvestris"))
result |> export_data(tempfile(fileext = ".vtr"))
result |> export_data(tempfile(fileext = ".csv"))
result |> export_data(tempfile(fileext = ".tsv"))

options(old)
```

gift_traits

Browse the bundled GIFT trait columns

Description

Returns the species-level trait columns available from the bundled GIFT enrichment, so you can pick which to attach in [add_gift\(\)](#). Read offline from the local .vtr (downloaded or built once); the first call may trigger that one-time download.

Usage

```
gift_traits()
```

Value

A data.frame with one row per trait column:

column The gift_<trait> column name.

type "numeric" or "character".

See Also

[add_gift\(\)](#), [enrichment_cols\(\)](#) for the same listing on any enrichment.

Examples

```
old <- options(taxify.data_dir = taxify_example_data())
gift_traits()
options(old)
```

id2name	<i>Resolve backbone IDs to names</i>
---------	--------------------------------------

Description

Looks up one or more backbone taxon IDs in a backbone and returns the name, rank, classification, and accepted-name resolution for each. The inverse of the `taxon_id` / `accepted_id` columns `taxify()` emits.

Usage

```
id2name(id, backbone = NULL, verbose = TRUE)
```

Arguments

<code>id</code>	A vector of backbone IDs (e.g. GBIF keys, ITIS TSNs, WoRMS AphiaIDs). Coerced to character, matched against the backbone's <code>taxon_id</code> . IDs are backbone-specific, so name the backbone they came from.
<code>backbone</code>	A single backbone name (e.g. "col", "gbif") or a <code>taxify_backend</code> object. NULL (default) uses the highest-priority installed backbone.
<code>verbose</code>	Logical. Default TRUE.

Value

A data.frame with one row per input ID (in input order), columns:

id The queried ID.
name Canonical name for that ID (NA if the ID is not in the backbone).
authorship Authorship of the name.
rank Taxonomic rank.
is_synonym Logical. Is this ID a synonym?
accepted_name The accepted name the ID resolves to (equals name when the ID is itself accepted).
family Family.
genus Genus.
backbone Backend used.

IDs not found in the backbone yield a row with NA name columns, so the output stays aligned one-to-one with the input.

See Also

`taxify()` for name -> ID, `synonyms()`, `add_classification()`.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Round-trip: resolve a name, then look its ID back up
r <- taxify("Quercus robur", backbone = "col")
id2name(r$taxon_id, backbone = "col")

options(old)
```

inspect

Inspect a name list for probable typos and other anomalies

Description

A quality-control pass over a name list. By default `inspect()` does not match names against backbones: on a plain character vector it runs the checks that need no matching – the genus register and the rest of the batch – and is fast and offline. To also surface the match-based anomalies (typo, synonym, ambiguous, geographic), either set `backbones = TRUE` (matches against every installed backbone, listed in the report) or match yourself first and inspect the result (`taxify(x) |> inspect()`). Either way it returns only the rows that look anomalous, each labelled with what stands out and, where known, the name to use instead.

Usage

```
inspect(
  x,
  backbones = FALSE,
  region = NULL,
  coords = NULL,
  range = c("present", "native", "introduced"),
  min_tier = c("note", "review", "unresolved"),
  verbose = TRUE
)
```

Arguments

<code>x</code>	A character vector of names, or a <code>taxify_result</code> from <code>taxify()</code> .
<code>backbones</code>	Logical. When <code>x</code> is a character vector, <code>TRUE</code> matches it against every installed backbone (via <code>taxify()</code>) so the match-based labels are available; <code>FALSE</code> (default) runs the register and list checks only, with no matching. The backbones used are printed in the report header. Ignored when <code>x</code> is already a <code>taxify_result</code> (it was matched already).
<code>region</code> , <code>coords</code> , <code>range</code>	Geographic constraint for the geographic / out_of_range checks, as in <code>taxify()</code> . These act on a <code>taxify_result</code> (which carries the accepted names they need); on a character vector there is nothing matched to place, so they have no effect.

<code>min_tier</code>	Lowest tier to report: "note" (default, everything), "review", or "unresolved".
<code>verbose</code>	Logical. Print progress messages. Default TRUE.

Details

Checks that need no matching (run on a character vector or a result):

`unknown` The genus is not in the genus register – the union of all 13 backbones' genera – so no backbone recognises it. The strong "probably not a real name" signal.

`near_duplicate` A near-twin of a more frequent name in the same list (small edit distance), so probably a misspelling of it. Computed from the list alone, so it catches typos in names no backbone contains.

`outlier_group` The name's kingdom group (from the register) is a tiny minority of an otherwise group-coherent list – the lone animal or fungus among plants, typically a cross-kingdom homonym typo.

Checks read from a `taxify()` result (only present when you inspect one):

`typo` Resolved only after fuzzy correction (`match_type = "fuzzy"`): the input most likely contains a spelling error; suggestion is the name.

`ambiguous` A homonym resolving to more than one accepted taxon.

`geographic` The matched species is real but has no WCVF record in the declared region / coords (vascular plants only).

`out_of_range` No region declared, yet the matched species' range falls outside the list's main TDWG continents (skipped for globally spread lists).

`case` Resolved only after ignoring case (`match_type = "exact_ci"`).

`synonym` The input is an outdated synonym; suggestion is the current accepted name.

Rows with no anomaly are dropped.

Each row gets a tier describing what it needs, not how bad it is: `unresolved` (no usable name – act on it), `review` (a name is there but its identity is uncertain – verify it), or `note` (correct, optional cleanup). `unknown` is unresolved; the identity-uncertain labels are `review`; `case` and `synonym` are `note`. An anomaly may be intended, so the tier is a triage hint, not a verdict.

The list-context labels (`near_duplicate`, `out_of_range`, `outlier_group`) judge a name against the rest of the batch, so they cannot apply to a single name: `inspect()` on one name warns and reports only the per-name labels. The register checks (`unknown`, and the register-derived `outlier_group`) need the genus register installed; without it they are skipped (with a message at `verbose`).

Value

A `taxify_inspection` data.frame (one row per anomalous name, ordered most-notable first) with columns `input_name`, `suggestion` (the name to use instead, or NA), `anomalies` (|-joined labels), `tier` (ordered factor `note < review < unresolved`), `reason`, `fuzzy_dist`, and `backbone`. Zero rows means nothing stood out.

See Also

[taxify\(\)](#), [taxify_regions\(\)](#)

Examples

```
old <- options(taxify.data_dir = taxify_example_data())

# On raw names: register + list checks (no matching)
inspect(c("Quercus robur", "Bogusus fakus", "Carexus mysteriosa",
          "Carexus mysteriosa", "Carexus mysteryosa"))

# Opt in to matching to also get typos, synonyms, ambiguity
inspect(c("Quercus robur", "Quercus robus"), backbones = TRUE)

# Or match yourself and inspect the result
taxify(c("Quercus robur", "Quercus robus")) |> inspect()

options(old)
```

install_backbones	<i>Install taxonomic backbones for offline matching</i>
-------------------	---

Description

Downloads the pre-built .vtr for each named backbone into the taxify data directory ([taxify_data_dir\(\)](#)), so subsequent [taxify\(\)](#) calls match against them offline. taxify installs its default set automatically on first use (COL, GBIF, ITIS); call this to pre-install a specific set, add a backbone to the default, or refresh to the latest release. Already-current backbones are skipped.

Usage

```
install_backbones(backbones = NULL, verbose = TRUE)
```

Arguments

backbones	Character vector of backbone names (see list_backbones()). NULL (default) installs taxify's first-run set: COL, GBIF, and ITIS.
verbose	Logical. Default TRUE.

Value

Invisibly, the backbones now installed (those that downloaded successfully), in priority order.

See Also

[list_backbones\(\)](#) for the full set with sizes, [taxify\(\)](#).

Examples

```
## Not run:
# Pre-install a marine-focused set before matching:
install_backbones(c("col", "worms"))

## End(Not run)
```

<code>list_backbones</code>	<i>List supported taxonomic backbones</i>
-----------------------------	---

Description

Returns every taxonomic backbone `taxify()` can match against, its taxonomic scope, and (once the manifest is reachable) its current version, name count, download size, and whether it is already installed locally. The counterpart to [list_enrichments\(\)](#) for the backbone side.

Usage

```
list_backbones(verbose = TRUE)
```

Arguments

`verbose` Logical. Default TRUE.

Value

A data.frame with columns: `name`, `scope`, `n_names`, `size_mb`, `version`, `installed`, `source`. `n_names`, `size_mb`, and `version` are NA for any backbone the manifest does not yet describe or when the manifest cannot be fetched offline.

See Also

```
list\_enrichments\(\), list\_traits\(\), taxify\_databases\(\).
```

Examples

```
## Not run:
list_backbones()

## End(Not run)
```

list_enrichments	<i>List available enrichments</i>
------------------	-----------------------------------

Description

Returns a summary of all enrichment layers available in the taxify manifest, including version, row count, whether the dataset is static, and which trait columns are provided.

Usage

```
list_enrichments(verbose = TRUE)
```

Arguments

verbose Logical. Default TRUE.

Value

A data.frame with columns: name, version, nrow, static, trait_cols (comma-separated), and source_url.

Examples

```
## Not run:  
list_enrichments()  
  
## End(Not run)
```

list_traits	<i>List the traits available to add_trait()</i>
-------------	---

Description

Returns the traits that [add_trait\(\)](#) can attach across sources, with their kind, canonical unit, and the number and names of contributing sources.

Usage

```
list_traits()
```

Value

A data.frame with one row per trait:

- trait** The trait name to pass to `add_trait()`.
- label** Human-readable label.
- kind** "numeric" or "categorical".
- unit** Canonical unit for numeric traits, NA for categorical.
- n_sources** Number of sources providing the trait.
- sources** Comma-separated source names.

See Also

`add_trait()`, `trait_info()`

Examples

```
list_traits()
```

lookup_genus	<i>Look up a genus in the register</i>
--------------	--

Description

Returns the register row for the given genus, or NULL if not found. Auto-loads the register on first call.

Usage

```
lookup_genus(genus)
```

Arguments

genus Character scalar. The genus name to look up.

Value

A one-row data.frame, or NULL if the genus is not in the register.

lowest_common	<i>Lowest common taxon of a set of names</i>
---------------	--

Description

Resolves the names and reports the deepest Linnaean rank at which they all share one classification value – their most recent common ancestor in the backbone’s hierarchy. Two congeners return their shared genus; two plants in different families return a shared order or class; unrelated taxa share only a kingdom (or nothing).

Usage

```
lowest_common(x, backbone = NULL, verbose = TRUE)
```

Arguments

x	Character vector of names (two or more), or a taxify() result.
backbone	Backend passed to taxify() when x is raw names. NULL (default) uses every installed backbone. Ignored when x is a result.
verbose	Logical. Default TRUE.

Value

A one-row data.frame with columns rank, name (the shared taxon), and n_taxa (how many resolved names went into the comparison). rank and name are NA when the taxa share nothing (e.g. different kingdoms, or only one resolved).

See Also

[class2tree\(\)](#), [add_classification\(\)](#), [taxify\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

lowest_common(c("Quercus robur", "Quercus petraea"))

options(old)
```

 parse_name

Parse taxonomic names into their structural parts

Description

Decomposes each name into genus, specific epithet, infraspecific rank and epithet, authorship, hybrid status, and any open-nomenclature qualifier, without matching against a backbone. Where `taxify()` cleans a name and then resolves it, `parse_name()` returns the cleaning step itself – the parts of the name – for callers who need the decomposition rather than a match (the role `rgbif::name_parse()` or `gnparser` fill). The same cleaning pipeline the matcher uses drives the parse, so a name breaks apart the way it matches.

Usage

```
parse_name(x)
```

Arguments

`x` Character vector of taxonomic names.

Value

A data.frame with one row per input name and columns:

input_name The original name as supplied.

genus The genus (first token), or a single-letter initial for an abbreviated genus ("Q. robur"). NA for an unresolvable hybrid formula.

specific_epithet The specific epithet, or NA for a bare genus.

infrasp_rank The infraspecific rank marker ("subsp.", "var.", "f.", ...) when the name has one, else NA.

infrasp_epithet The infraspecific epithet, else NA.

authorship The authorship the name carries (trailing form, e.g. "(L.) H.Karst."), or NA.

qualifier Any open-nomenclature / uncertainty qualifier ("cf.", "aff.", "sp.", "agg.", "s.l.", ...), canonicalized, or NA. Infraspecific rank markers are reported in `infrasp_rank`, not here.

is_hybrid Logical. Was a hybrid marker detected?

hybrid_type "nothogenus", "nothospecies", "formula", or NA.

rank "genus", "species", "infraspecies", "hybrid_formula", or NA for an empty input.

canonical The cleaned name used for matching (genus plus epithets, qualifiers and authorship removed, hybrid sign dropped). NA for a hybrid formula, which is not a single taxon.

See Also

`taxify()` to match a name; `parse_name()` exposes the same internal cleaning pipeline the matcher runs.

Examples

```
parse_name(c("Quercus robur L.",
             "Poa annua var. annua",
             "Q. robur",
             "Pinus cf. sylvestris",
             "Salix alba x Salix fragilis"))
```

reconcile

Reconcile a checklist against a backbone's current treatment

Description

Classifies each name in a list against what a backbone currently accepts, so a checklist assembled at one time can be checked against the taxonomy as it stands now. Where `taxify()` returns the resolved match per name, `reconcile()` adds the editorial verdict – unchanged, now a synonym, a misspelling, ambiguous, or unresolved – and flags names that merge onto a single accepted taxon.

Usage

```
reconcile(x, backbone = NULL, ..., verbose = TRUE)
```

Arguments

<code>x</code>	Character vector of names (a checklist).
<code>backbone</code>	Character vector of backbone names or a <code>taxify_backend</code> object, passed to <code>taxify()</code> . <code>NULL</code> (default) uses every installed backbone.
<code>...</code>	Further arguments passed to <code>taxify()</code> (e.g. <code>fuzzy</code> , <code>fuzzy_threshold</code> , <code>kingdom</code>).
<code>verbose</code>	Logical. Default <code>TRUE</code> .

Value

A `data.frame` with one row per input name, columns:

input_name The name as supplied.

accepted_name The name it resolves to now (NA if unresolved).

status One of: "unchanged" (resolves to itself, still accepted), "synonym" (now a synonym of a different accepted name), "misspelling" (resolved by fuzzy/abbrev match to a corrected spelling), "ambiguous" (a homonym resolving to several accepted taxa; see `taxify_candidates()`), "unresolved" (no match).

is_synonym Logical, from `taxify()`.

match_type The `taxify()` match type.

merged Logical. `TRUE` when two or more input names resolve to this same accepted name (a many-to-one collapse).

merged_with |-joined other input names sharing this accepted name, or NA.

backbone Backend that matched (NA if unresolved).

See Also

[taxify\(\)](#), [taxify_candidates\(\)](#) to expand the ambiguous rows, [synonyms\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Quercus pedunculata is now a synonym of Quercus robur; "Quercus robur" is a
# misspelling of it; a bad name is unresolved.
reconcile(c("Quercus robur", "Quercus pedunculata", "Quercus robur",
            "Notagenus imarginus"),
          backbone = "wfo", verbose = FALSE)

options(old)
```

sci2comm	<i>Resolve scientific names to common (vernacular) names</i>
----------	--

Description

The forward direction of [comm2sci\(\)](#): given a scientific name, return the common name(s) it is known by. Reads the bundled `common_names` enrichment (GBIF, NCBI, and Open Tree vernaculars) offline; the first call may trigger the one-time download. Where [add_common_names\(\)](#) attaches vernaculars to a [taxify\(\)](#) result as columns, `sci2comm()` takes bare names and returns the long lookup table – one row per (name, vernacular). A name maps to many common names (across languages and synonyms), so a query can carry several rows.

Usage

```
sci2comm(x, lang = NULL, resolve = TRUE, backbone = NULL, verbose = TRUE)
```

Arguments

x	Character vector of scientific names.
lang	Character. Restrict to one language: an ISO 639-1 code ("en", "de", ...) as used by the GBIF source, or NA for the untagged NCBI/Open Tree names. NULL (default) returns every language. List the languages present with <code>enrichment_groups("common_names")</code> .
resolve	Logical. When TRUE (default), each input is run through taxify() first so a synonym or misspelling reports its accepted taxon's vernaculars. When FALSE, the input name is looked up verbatim (faster, offline; use when the names are already accepted).
backbone	Passed to taxify() when <code>resolve = TRUE</code> ; NULL (default) uses every installed backbone. Ignored when <code>resolve = FALSE</code> .
verbose	Logical. Default TRUE.

Value

A data.frame with one row per (query, vernacular):

input_name The scientific name as supplied.

accepted_name The accepted name looked up (equals input_name when resolve = FALSE or the input_name was already accepted).

common_name A vernacular name.

lang Language tag (NA for NCBI/Open Tree).

A query with no vernacular contributes no rows.

See Also

[comm2sci\(\)](#) for the reverse direction (common -> scientific), [add_common_names\(\)](#) to attach vernaculars to a [taxify\(\)](#) result.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# The bundled example maps Quercus robur -> "example_common_name" (en + de)
sci2comm("Quercus robur", resolve = FALSE)

options(old)
```

synonyms	<i>List the synonyms of a name</i>
----------	------------------------------------

Description

The reverse of the forward resolution [taxify\(\)](#) does: each input name is resolved to its accepted taxon, then every synonym that points to that accepted taxon in the backbone is returned. Useful for auditing which historical names collapse onto a current name.

Usage

```
synonyms(x, backbone = NULL, verbose = TRUE)
```

Arguments

x	Character vector of names (accepted names or synonyms; each is resolved to its accepted taxon first).
backbone	A single backbone name (e.g. "wfo") or a <code>taxify_backend</code> object. NULL (default) uses the highest-priority installed backbone.
verbose	Logical. Default TRUE.

Value

A data.frame with one row per synonym found, columns:

input_name The queried name.

accepted_name The accepted name the query resolved to.

synonym A synonym of that accepted taxon.

authorship Authorship of the synonym.

rank Rank of the synonym.

taxon_id Backend ID of the synonym.

backbone Backend used.

Names that resolve to an accepted taxon with no synonyms contribute no rows.

See Also

[taxify\(\)](#) for the forward direction, [children\(\)](#) to list the accepted taxa within a genus or family.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Amphibolurus vitticeps is a synonym of Pogona vitticeps
synonyms("Pogona vitticeps", backbone = "reptiledb")

options(old)
```

taxify

Match taxonomic names against local backbone databases

Description

Matches a vector of taxonomic names against locally stored Darwin Core backbone databases. Returns a data.frame with one row per input name containing the matched name, accepted name, taxonomic hierarchy, and match quality information.

Usage

```
taxify(
  x,
  backbone = NULL,
  fuzzy = TRUE,
  fuzzy_threshold = 0.2,
  fuzzy_method = c("dl", "levenshtein", "jw"),
  aggregates = c("preserve", "collapse"),
```

```

region = NULL,
coords = NULL,
range = c("present", "native", "introduced"),
kingdom = NULL,
mode = c("fallback", "wide", "agreement"),
verbose = TRUE
)

```

Arguments

x	Character vector of taxonomic names.
backbone	Character vector of backbone names (e.g., "wfo", "col", "gbif") or a single taxify_backend object. Several are tried in order as a fallback chain. NULL (default) uses every installed backbone in priority order, installing the default set (COL, GBIF, ITIS) on first use; override the priority with options(taxify.backbone_priority = ...) and the first-run set with options(taxify.default_backbones = ...).
fuzzy	Logical. Enable fuzzy matching for names that fail exact match. Default TRUE.
fuzzy_threshold	Numeric. Maximum allowed distance for fuzzy matches. Two modes depending on the value: • Fractional ($0 < \text{fuzzy_threshold} < 1$): normalized distance (edits / max name length). Default 0.2 is about 1 edit per 5 characters. • Integer ($\text{fuzzy_threshold} \geq 1$): maximum raw edit count, e.g. fuzzy_threshold = 2L allows at most 2 insertions/deletions/substitutions regardless of name length. Not supported for fuzzy_method = "jw".
fuzzy_method	Character. One of "dl" (Damerau-Levenshtein, default), "levenshtein", or "jw" (Jaro-Winkler).
aggregates	Character. How to treat species aggregates (names with an agg. / s.l. qualifier). "preserve" (default) keeps the aggregate as its own concept: it matches the backbone's aggregate taxon (" <binomial> aggr. ") where one exists, otherwise falls back to the binomial. When it falls back, the aggregate_fallback column is set TRUE so the aggregate-to-species collapse is visible rather than silent (only the aggregate-bearing backbones – Euro+Med, WoRMS – carry aggregate taxa, so preserve falls back for the others). "collapse" strips the marker and matches the binomial species, the way any non-aggregate name is matched. Either way the qualifier is recorded in the qualifier column.
region	Region(s) to constrain fuzzy matching to, or NULL (default) for no geographic constraint. Botanical (WCVP, vascular plants): TDWG Level 3 codes ("BGM", c("BGM", "GER")) or region names at any level, matched case- and accent-insensitively against the bundled WGSRPD crosswalk – a Level 3 name ("Belgium"), a Level 2 region ("Middle Europe"), or a Level 1 continent ("Europe", which expands to all its codes). Marine (only when the marine_distribution asset is installed): a MEOW ecoregion ECO_CODE, or an ecoregion / province / realm name (a province or realm expands to its member ecoregions). See taxify_regions() for both lists. When set, fuzzy candidates are restricted to species with range records in the region(s); exact matches are always kept. The filter only narrows genuinely ambiguous fuzzy candidates: a candidate is

dropped only when the same input name has another candidate that is in-region or has no range data, so a match in a group with no range coverage is never affected and a name whose only candidate is out-of-region is still returned.

coords	Coordinates to constrain fuzzy matching to, mapped to region codes by point-in-polygon and unioned with region. Points are tested against the WGSRPD botanical boundaries (yielding TDWG codes) and, when the marine asset is installed, the MEOW ecoregion boundaries (yielding ECO_CODES), so a coastal point can resolve to both. A single <code>c(lon, lat)</code> pair, a matrix/data.frame of longitude/latitude columns (named <code>lon/lat</code> or <code>x/y</code> , else the first two columns as <code>lon, lat</code>), or a point-geometry spatial object (an <code>sf</code> / <code>sfc</code> object or a terra <code>SpatVector</code> , reprojected to longitude/latitude automatically). NULL (default) for none. Each boundary file is downloaded once and cached; coordinate lookup needs that download (or a prior cache). The point-in-polygon test uses terra or sf when installed, otherwise a native fallback; force the engine with <code>options(taxify.pip_engine = "terra" "sf" "native")</code> .
range	Character. Which range statuses count as in-region when region or coords is set. "present" (default) accepts any record (native, introduced, extinct, or unknown status) – the right choice for name disambiguation. "native" accepts only native records, "introduced" only introduced (alien) records; both fold an ecological filter into matching and are for callers who want that. Ignored when no region is set.
kingdom	Character. Restrict matches to one or more kingdoms, to disambiguate a name shared across kingdoms (a <i>Prunella</i> that is both a bird and a plant, an <i>Oenanthe</i> that is both). NULL (default) applies no constraint. Accepts a kingdom name or a common alias, case-insensitively: "animals"/"Animalia"/"Metazoa", "plants"/"Plantae", "fungi", "bacteria", "archaea", "chromista", "protozoa", "viruses". A matched taxon is kept only when its kingdom is the requested one (or is unknown, which is never rejected); with the default multi-backbone fallback, a name a backbone resolves into the wrong kingdom is passed on to the next backbone, so the in-kingdom treatment wins. The kingdom is read from the backbone where it stores one (COL, ITIS, NCBI, OTT, WoRMS); for a backbone that does not (WFO, GBIF), it falls back to the genus register's kingdom, which cannot split a genus that is itself homonymous across kingdoms – name a kingdom-appropriate backbone for those.
mode	Character. How to combine results when backbone names more than one backbone. "fallback" (default) is the fallback chain described above: one answer per name, from the first backbone that matched. "wide" and "agreement" instead consult every backbone for every name and report how they compare, so a backbone disagreement (see the <i>Backbone-specific accepted names</i> section) is visible in one call rather than by querying each backbone by hand. Both return a strict superset of the "fallback" result (the same standard columns, with <code>accepted_name</code> still the fallback pick, so the frame still pipes into the <code>add_*</code> (<code>enrichments</code>) plus: • "wide": one <code>accepted_<backbone></code> column per backbone and a logical <code>all_agree</code>. • "agreement": <code>n_backbones_matched</code>, <code>n_distinct_accepted</code>, and <code>all_agree</code>.

all_agree is TRUE/FALSE when at least two backbones matched the name and NA when fewer than two did (nothing to compare). Ignored (with a message) when only one backbone is given, since there is nothing to compare.

verbose Logical. Print progress messages. Default TRUE.

Details

By default `taxify()` matches against **every installed backbone**, tried in priority order as a fallback chain: a name is resolved by the first backbone (COL, then the domain authorities, then the broad aggregators) that matches it, and names matched earlier are not re-matched later. On a fresh setup with nothing installed yet, the first call downloads a default set (COL, GBIF, ITIS) once; pre-install a different set with `install_backbones()`. Name a backbone (or several) explicitly to match only against that one, or those in that order.

Value

A data.frame with one row per input name and the following columns:

input_name The original name as provided.

matched_name Full name in the backbone that matched. For an unresolved hybrid formula (`match_type = "hybrid_formula"`) it holds the input-parent cross (e.g. "Salix alba x Salix fragilis") when both parents resolve, else NA.

accepted_name Resolved accepted name (equals `matched_name` if not a synonym). For a hybrid formula it holds the accepted-parent cross (both parents resolved), else NA.

taxon_id Backend-specific ID of the matched name.

accepted_id ID of the accepted name.

rank Taxonomic rank (species, subspecies, genus, etc.).

family Family name.

genus Genus name.

epithet Specific epithet.

authorship Authorship of the matched name.

accepted_authorship Authorship of the accepted name. For a synonym this is the author of the resolved accepted name, not the synonym's own author, so `accepted_name` and `accepted_authorship` together form the accepted name's full citation.

is_synonym Logical. Was the match a synonym?

is_hybrid Logical. Was a hybrid marker detected in the input?

hybrid_type "nothogenus" ("x Cupressocyparis leylandii"), "nothospecies" ("Quercus x hispanica"), "formula" ("Salix alba x Salix fragilis"), or NA for a non-hybrid. Nothogenus and nothospecies resolve to a single backbone taxon in the usual columns; a formula does not (its `match` columns are NA and `match_type` is "hybrid_formula"). The parent binomials of a formula, and their accepted names, are added on demand by `add_hybrid_info()`.

qualifier Canonical taxonomic qualifier found in the input name ("cf.", "aff.", "agg.", "s.l.", "s.str.", "sp.", ...), or NA. Spelling variants are folded to one token ("aggr.", "agg" and "sensu lato" all map to "agg."/"s.l.").

qualifier_position "genus" when the qualifier leads the name and qualifies the whole name (e.g. "Cf. *Pinus sylvestris*"), "species" when it qualifies the species (inline cf. or trailing agg.), NA when there is no qualifier.

aggregate_fallback Logical. For an aggregate query under `aggregates = "preserve"`: FALSE when it resolved to the backbone's dedicated aggregate taxon, TRUE when no such taxon existed and it fell back to the nominal binomial. NA for non-aggregate queries and under `aggregates = "collapse"`, where the collapse is explicit.

match_type One of "exact", "exact_ci", "fuzzy", "abbrev" (an abbreviated genus such as "Q. robur" resolved via genus initial plus epithet), "hybrid_formula" (a two-parent cross; the row's backbone-match columns are NA and the parents are resolved into the `hybrid_parent_*` columns instead), or "none".

fuzzy_dist Normalized string distance (0–1), NA if exact.

is_ambiguous Logical. TRUE when the matched scientificName had multiple synonym rows pointing to different accepted taxa at the same priority tier (homonym ambiguity). Disambiguated via `nomenclaturalStatus = "Valid"` when that column is in the backbone; for irreducible ambiguity, the scalar columns hold one candidate.

ambiguous_targets Character. |-joined list of conflicting accepted taxon IDs when `is_ambiguous = TRUE`; NA otherwise.

backbone Which backbone was used (e.g., "wfo", "col", "gbif").

backbone_version Backend name, version, and download date (e.g., "wfo: 2024-12 (2026-04-01)"). Useful for reproducibility.

kingdom_group Coarse kingdom-level group of the matched genus, from the bundled genus register (used for cross-kingdom disambiguation); NA when the genus is not in the register.

taxon_group Broad taxonomic group of the matched genus, from the genus register; NA when unavailable.

life_form Life-form classification of the matched genus, from the genus register's family-based lookup; NA when unavailable.

Backbone-specific accepted names

Each backbone is an independent taxonomy, and they can legitimately disagree on which name is accepted and which is a synonym. `taxify()` returns the matched backbone's own current treatment; it does not reconcile backbones against each other by voting (a consensus would regress toward the most conservative treatment across backbones that copy one another). With the default multi-backbone fallback, `accepted_name` is the pick of the highest-priority backbone that matched. To see where backbones disagree, pass `mode = "wide"` (or "agreement") for each backbone's `accepted_name` side by side; to follow one authority, name a single backbone.

For example, the red and parma kangaroos: the GBIF Backbone Taxonomy accepts *Macropus rufus* and *Macropus parma*, treating *Osphranter rufus* and *Notamacropus parma* as synonyms of them, so `taxify("Osphranter rufus", backbone = "gbif")` resolves to *Macropus rufus*. The Catalogue of Life splits the genus and does the reverse, so `taxify("Macropus rufus", backbone = "col")` resolves to *Osphranter rufus*. Both are faithful to their source; the difference is in the backbones, not in the matching.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Match a few names
taxify(c("Quercus robur", "Pinus sylvestris"))

# Disable fuzzy matching
taxify("Quercus robur", fuzzy = FALSE)

# Constrain fuzzy candidates to a geographic region: a TDWG Level 3 code,
# or a region name resolved via the bundled WGSRPD crosswalk
taxify("Quercus robur", region = "EUR")
taxify("Quercus robur", region = "Belgium")

# Constrain by coordinates (downloads WGSRPD boundaries on first use)
## Not run:
taxify("Quercus robur", coords = c(4.35, 50.85))

## End(Not run)

# Fallback chain: try WFO first, then COL for unmatched
taxify(c("Quercus robur", "Panthera leo"),
       backbone = c("wfo", "col"))

# Compare how two backbones resolve the same names, side by side
taxify(c("Quercus robur", "Pinus sylvestris"),
       backbone = c("wfo", "col"), mode = "wide")

options(old)
```

taxify_build	<i>Build a backbone database from source</i>
--------------	--

Description

Builds the backbone .vtr for a backend from its upstream Darwin Core source, delegating to the sibling taxifydb package (which must be installed). This is the from-source path, for rebuilding a backbone locally.

Usage

```
taxify_build(backend, dest = NULL, verbose = TRUE, ...)
```

Arguments

backend	A taxify_backend object or a character string (e.g., "wfo").
dest	Character. Destination directory. Defaults to <code>taxify_data_dir()</code> .

verbose Logical. Print progress messages.
 ... Additional arguments passed to methods.

Details

For everyday use you do not need this: `taxify()` auto-downloads the pre-built `.vtr` on first use, and `taxify_download()` fetches a pre-built backbone directly without `taxifydb`.

Value

The path to the `.vtr` file (invisibly).

See Also

`taxify_download()` to fetch a pre-built backbone, `taxify()` which downloads on first use.

`taxify_build_register` *Build the genus register from source*

Description

Rebuilds `genus_register.vtr` and `backend_coverage.vtr` locally instead of downloading the published pair. The build itself lives in `taxifydb`, which resolves every backbone in the register's fixed backbone set and can take well over an hour; the download takes seconds and yields the same file, so this is an escape hatch rather than the normal route.

Usage

```
taxify_build_register(verbose = TRUE)
```

Arguments

verbose Logical. Print progress messages. Default TRUE.

Details

`taxify_download("register")` fetches the published pair.

Value

Path to `genus_register.vtr` (invisibly).

See Also

`taxify_load_register()` to load it into memory, `taxify_register_coverage()` to query backbone coverage for a genus.

taxify_candidates	<i>Expand ambiguous matches into their candidate taxa</i>
-------------------	---

Description

Where `taxify()` meets an irreducible homonym – a name whose synonyms point to several accepted taxa at the same priority tier – it records one candidate in the scalar columns, sets `is_ambiguous` = TRUE, and lists the conflicting accepted taxon IDs in `ambiguous_targets`. This verb expands those rows into one row per candidate, resolved to full names against the backbone, so you can choose the right taxon yourself instead of relying on the automatic tiebreak.

Usage

```
taxify_candidates(x, verbose = TRUE)
```

Arguments

x	A <code>taxify()</code> result.
verbose	Logical. Default TRUE.

Value

A data.frame with one row per (ambiguous input, candidate taxon):

input_name The queried name.

chosen The accepted name `taxify()` picked for that row.

candidate A candidate accepted name.

authorship Authorship of the candidate.

rank Rank of the candidate.

family Family of the candidate.

genus Genus of the candidate.

taxon_id Backend ID of the candidate.

backbone Backend used.

Empty when no rows were ambiguous.

See Also

`taxify()`, `synonyms()`.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Homonyms are rare; on an unambiguous result this is an empty frame.
taxify("Quercus robur") |>
  taxify_candidates()

options(old)
```

taxify_clear_cache	<i>Clear all cached backbones</i>
--------------------	-----------------------------------

Description

Removes all loaded backbone handles from memory. The next call to `taxify()` will re-load from disk.

Usage

```
taxify_clear_cache()
```

Value

No return value, called for side effects.

taxify_databases	<i>One overview of every database taxify knows about</i>
------------------	--

Description

Stacks the taxonomic backbones (from `list_backbones()`) and the trait/status enrichments (from `list_enrichments()`) into a single frame with a type column, so a new user can see the full breadth in one call rather than needing to know three separate discovery verbs. The cross-source trait vocabulary is summarised in the message footer; browse it with `list_traits()`.

Usage

```
taxify_databases(verbose = TRUE)
```

Arguments

verbose	Logical. When TRUE (default), prints a one-line count of backbones, enrichments, and registered traits.
---------	---

Value

A data.frame with columns: type ("backbone" or "enrichment"), name, scope (taxonomic scope for backbones; provided trait columns for enrichments), n_rows, version, installed, source.

See Also

[list_backbones\(\)](#), [list_enrichments\(\)](#), [list_traits\(\)](#).

Examples

```
## Not run:  
taxify_databases()  
  
## End(Not run)
```

taxify_data_dir	<i>Get the taxify data directory</i>
-----------------	--------------------------------------

Description

Returns the directory where taxify stores downloaded backbone and enrichment .vtr files. By default this is the platform-appropriate per-user cache returned by [tools::R_user_dir\(\)](#) (available since R 4.0).

Usage

```
taxify_data_dir()
```

Details

The location can be overridden, in order of precedence, by the `taxify.data_dir` option (`getOption("taxify.data_dir")`) or the `TAXIFY_DATA_DIR` environment variable. This is useful to point taxify at a shared cache, or at the small bundled example database returned by [taxify_example_data\(\)](#).

Value

Character string. Path to the data directory.

taxify_download	<i>Download a pre-built taxify backbone</i>
-----------------	---

Description

Downloads a pre-built .vtr backbone from GitHub Releases using the taxify manifest. This needs no build tools and does not require taxifydb; it is the fast path `taxify()` uses internally on first use. Call it directly to pre-fetch backbones before an offline session. Progress is always shown; no prompts are shown, so calling this function is consent.

Usage

```
taxify_download(backbone = "wfo", version = "latest", verbose = TRUE)
```

```
taxify_download_vtr(backbone = "wfo", version = "latest", verbose = TRUE)
```

Arguments

backbone	Character. A backbone name (e.g. "wfo", "col", "gbif", ...; see the backbones in <code>list_enrichments()</code> 's companion manifest) or "register" for the genus register. Multiple backbones can be given as a character vector.
version	Character. "latest" (default) downloads into <data_dir>/<backbone>/latest/ and will be overwritten on future updates. A specific version string (e.g., "2024.01") downloads into a pinned folder that is never overwritten.
verbose	Logical. Default TRUE.

Details

If no pre-built .vtr is available for a backbone, it falls back to building from source via `taxify_build()` (which requires taxifydb).

Value

The path(s) to the downloaded .vtr file(s) (invisibly).

See Also

`taxify_build()` to build a backbone from source via taxifydb, `taxify_download_enrichment()` for enrichment layers.

taxify_download_enrichment

Download one or more enrichment .vtr files

Description

Downloads pre-built enrichment .vtr files from the taxify manifest.

Usage

```
taxify_download_enrichment(enrichment, version = "latest", verbose = TRUE)
```

Arguments

enrichment	Character. One or more enrichment names (e.g., "iucn", "griis", "zanne").
version	Character. "latest" (default) or a specific version string.
verbose	Logical. Default TRUE.

Details

Available enrichments:

iucn IUCN conservation status (LC/NT/VU/EN/CR/EW/EX)
griis GRIIS invasive species status by country
zanne Zanne et al. 2014 woody/herbaceous classification
wcvp WCVP native range by TDWG botanical region
eive EIVE 1.0 ecological indicator values (European plants)
diaz_traits Diaz et al. 2022 seed mass and plant height
elton_traits EltonTraits 1.0 diet and foraging (birds + mammals)
avonet AVONET bird morphology and migration
pantheria PanTHERIA mammal life-history traits
common_names GBIF vernacular names (multi-language)
amphibio AmphibiO amphibian life-history and ecological traits
leda LEDA Traitbase NW European plant traits (Kleyer et al. 2008)

Value

The path(s) to the downloaded .vtr file(s) (invisibly).

taxify_example_data	<i>Path to the bundled example database</i>
---------------------	---

Description

taxify ships a tiny example database (a handful of species per backbone plus matching enrichment tables) so that examples and quick experiments run offline, without downloading the full multi-million-row backbones.

Usage

```
taxify_example_data()
```

Details

Point taxify at it for the current session by setting the `taxify.data_dir` option:

```
old <- options(taxify.data_dir = taxify_example_data())
taxify("Quercus robur") |> add_zanne()
options(old) # restore the real data directory
```

The example database is read-only and covers only the species used in the package examples; use the full downloaded backbones for real work.

Value

Character string. Path to the bundled example database directory, or "" if it is not installed.

See Also

[taxify_data_dir\(\)](#)

taxify_load_register	<i>Load the unified genus register into memory</i>
----------------------	--

Description

Reads `genus_register.vtr` and caches it as a `data.frame` in `.taxify_env$register`, downloading it on first use. Subsequent calls reuse the cached version unless `force = TRUE`.

Usage

```
taxify_load_register(force = FALSE, verbose = TRUE)
```

Arguments

force	Logical. If TRUE, reloads from disk even if already cached. Default FALSE.
verbose	Logical. Print progress messages. Default TRUE.

Details

The register contains one row per genus with columns genus, kingdom, phylum, class, order, family, kingdom_group, taxon_group and life_form.

Value

The register data.frame (invisibly).

taxify_lock	<i>Record the exact backbone and enrichment versions behind a result</i>
-------------	--

Description

Writes a machine-readable lockfile pinning which backbone and enrichment assets – name, version, and byte-identity (content id) – produced a `taxify()` result. Where `cite()` prints prose citations, `taxify_lock()` records the reproducible counterpart, so a manuscript’s Methods can state exactly what was matched against and `taxify_restore()` can later verify an install still matches.

Usage

```
taxify_lock(x = NULL, file = NULL, verbose = TRUE)
```

Arguments

x	A <code>taxify()</code> result (its resolved backbones and any <code>add_*</code> () enrichment layers are locked), or NULL (default) to snapshot every installed backbone.
file	Optional path to write the lockfile to (JSON). When NULL (default) nothing is written and the lock is only returned.
verbose	Logical. Default TRUE.

Value

A lock list (invisibly when file is written), with elements `taxify_version`, `created`, `r_version`, `backbones`, and `enrichments`.

See Also

`taxify_restore()` to check an install against a lockfile, `cite()` for prose citations.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

res <- taxify("Quercus robur", backbone = "wfo", verbose = FALSE)
lock <- taxify_lock(res)
lock$backbones[[1]]$name

options(old)
```

taxify_long	<i>Reshape grouped enrichment columns to long format</i>
-------------	--

Description

Converts wide-format columns produced by grouped enrichments (e.g., `invasive_status_AT`, `invasive_status_DE`) back to long format with one row per species x group combination.

Usage

```
taxify_long(x, cols = NULL, group_col = NULL, drop_na = FALSE)
```

Arguments

<code>x</code>	A data.frame, typically a <code>taxify()</code> result after applying a grouped enrichment like <code>add_griis()</code> , <code>add_alien_first_records()</code> , or <code>add_wcvp()</code> .
<code>cols</code>	Character vector of base column names to reshape. These are the column names without the group suffix (e.g., "invasive_status", not "invasive_status_AT"). If omitted, auto-detected from the enrichment metadata stamped by the <code>add_*</code> () functions.
<code>group_col</code>	Character. Name for the output group column. If omitted, auto-detected from enrichment metadata (e.g., "country_code" for invasive status or alien first records).
<code>drop_na</code>	Logical. If TRUE, drop rows where all value columns are NA. Default FALSE.

Details

When `cols` and `group_col` are omitted, `taxify_long()` reads the reshape metadata attached by grouped enrichment functions (`add_griis()`, `add_alien_first_records()`, `add_wcvp()`, `add_common_names()`). If multiple grouped enrichments were applied, all are reshaped together (they must share the same group column).

Column matching uses the explicit base names in `cols` to avoid ambiguity. For example, given `cols = c("alien_first_record", "alien_first_record_source")`, the column `alien_first_record_source_AT` is correctly matched to base `alien_first_record_source` (not `alien_first_record` with suffix `source_AT`), because longer base names are matched first.

If the columns in `x` exactly match `cols` (no suffixed variants), the data is already in single-group format. In this case, the data.frame is returned unchanged with `group_col` set to NA.

Value

A data.frame in long format. All columns from x that are not part of the reshape are preserved. The reshaped columns use their base names (without suffix), and a new group_col column contains the group code extracted from the suffix.

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# Auto-detected: no cols or group_col needed
taxify("Robinia pseudoacacia") |>
  add_alien_first_records(country = c("AT", "DE")) |>
  taxify_long()

# Explicit: override auto-detection
taxify("Robinia pseudoacacia") |>
  add_griis(country = c("AT", "DE")) |>
  taxify_long(cols = "invasive_status", group_col = "country")

options(old)
```

`taxify_refresh_manifest`*Invalidate the session manifest cache*

Description

Forces the next `fetch_manifest()` call to re-fetch from the network. Useful after the maintainer updates the manifest between R sessions without restarting R.

Usage

```
taxify_refresh_manifest()
```

Value

No return value, called for side effects.

taxify_regions	<i>List the regions accepted by region=</i>
----------------	---

Description

Returns every region code and name the region argument of `taxify()` resolves, across both vocabularies it accepts, optionally filtered by a search term matched (case- and accent-insensitively) against the code and all three level names.

Usage

```
taxify_regions(search = NULL, scheme = c("all", "wgsrpd", "meow"))
```

Arguments

search	Optional character string. If supplied, only regions whose code or name contains it are returned.
scheme	Which vocabulary to list: "all" (the default), "wgsrpd" for the botanical regions, or "meow" for the marine ones.

Details

Botanical regions (scheme = "wgsrpd") come from the bundled WGSRPD (World Geographical Scheme for Recording Plant Distributions) Level 3 crosswalk, and are also the codes `add_wcvp()` uses. Marine regions (scheme = "meow") are the Marine Ecoregions of the World, listed only when the `marine_distribution` asset is installed, since that is also when `region=` resolves them. The two schemes nest the same way, so they share the three name columns: a MEOW ecoregion is the name, its province the `level2_name`, and its realm the `level1_name`.

Value

A `data.frame` with columns `code`, `name`, `level2_name`, `level1_name`, and `scheme`, one row per region.

Examples

```
head(taxify_regions())
taxify_regions("belgium")
taxify_regions("Europe")
```

`taxify_register_coverage`*Show backbone coverage for a genus*

Description

Queries `backend_coverage.vtr` to determine which backbones contain the given genus, along with the backbone version at time of indexing.

Usage

```
taxify_register_coverage(genus)
```

Arguments

<code>genus</code>	Character scalar. The genus name to query.
--------------------	--

Value

A `data.frame` with columns `genus`, `backbone`, `version`, `date_added`. Returns a zero-row `data.frame` if the genus is not found in any backbone.

`taxify_restore`*Check an install against a lockfile*

Description

Reads a lockfile written by `taxify_lock()` and reports, for each backbone and enrichment it pins, whether the currently installed asset matches – by version and byte-identity (content id) – or has drifted, or is missing. `taxify` serves only the latest version of each asset, so `taxify_restore()` verifies and reports rather than force-installing a historical version; a drift row tells you the recorded run cannot be reproduced byte-for-byte with the current downloads.

Usage

```
taxify_restore(file, verbose = TRUE)
```

Arguments

<code>file</code>	Path to a lockfile written by <code>taxify_lock()</code> , or the lock list it returned.
<code>verbose</code>	Logical. Default TRUE.

Value

A data.frame with one row per pinned asset, columns: component, type ("backbone"/"enrichment"), locked_version, installed_version, locked_content_id and installed_content_id (short), and status ("ok", "version_drift", "content_drift", "missing", or "unverified" when neither a version nor a content id could be compared).

See Also

[taxify_lock\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

res <- taxify("Quercus robur", backbone = "wfo", verbose = FALSE)
lock <- taxify_lock(res)
taxify_restore(lock, verbose = FALSE)

options(old)
```

trait_info

Describe a trait's sources and units

Description

Prints the kind, canonical unit, and (for categorical traits) the shared vocabulary of a trait, and returns a data.frame of the sources [add_trait\(\)](#) draws from – one row per source, with its enrichment, source column, citation, and the harmonization note (unit conversion or vocabulary mapping).

Usage

```
trait_info(trait)
```

Arguments

trait Character. A single trait name; see [list_traits\(\)](#).

Value

A data.frame (invisibly-friendly) with columns source, enrichment, column, citation, note (unit or vocabulary harmonization), and caution (a method or definition difference from the reference source, or NA). The header line (label, kind, unit, default priority, vocabulary) is printed as a message.

See Also

[add_trait\(\)](#), [list_traits\(\)](#)

Examples

```
trait_info("woodiness")
```

upstream

List the higher classification (ancestors) of a taxon

Description

Returns the lineage above taxon – its genus, family, order, class, phylum, and kingdom, for whichever of those ranks the backbone stores – as a tidy frame with one row per ancestor rank. Where [downstream\(\)](#) reaches down to descendants, [upstream\(\)](#) reaches up to ancestors; where [add_classification\(\)](#) attaches the ranks to an existing [taxify\(\)](#) result, [upstream\(\)](#) takes a bare name. A synonym or misspelling is resolved to its accepted taxon first, so the lineage returned is the accepted taxon's.

Usage

```
upstream(taxon, backbone = NULL, to = NULL, verbose = TRUE)
```

Arguments

taxon	A single taxonomic name (a species, genus, or higher taxon; synonyms and typos are resolved first).
backbone	A single backbone name or a taxify_backend object. NULL (default) uses the highest-priority installed backbone; name one that stores the higher ranks (e.g. "col") for a full lineage.
to	Optional rank (or ranks) to restrict the output to – e.g. <code>to = "family"</code> answers "what family is this in?" with a single row. NULL (default) returns the whole lineage.
verbose	Logical. Default TRUE.

Value

A data.frame with one row per ancestor rank, columns: `input_name` (the name as supplied), `accepted_name` (what it resolved to), `rank`, `name`, `backbone`, ordered kingdom -> genus. Empty when taxon does not resolve or the backbone stores no ranks above it.

See Also

[downstream\(\)](#) for descendants, [add_classification\(\)](#) to attach the ranks to a [taxify\(\)](#) result, [lowest_common\(\)](#).

Examples

```
# Runs offline against the bundled example database.
old <- options(taxify.data_dir = taxify_example_data())

# The lineage above a species (reptiledb carries the full higher hierarchy)
upstream("Naja naja", backbone = "reptiledb")

# Just the family
upstream("Naja naja", backbone = "reptiledb", to = "family")

options(old)
```

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