

Package ‘rvertnet’

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Title Search 'Vertnet', a 'Database' of Vertebrate Specimen Records

Description Retrieve, map and summarize data from the 'VertNet.org' archives (<<http://vertnet.org/>>). Functions allow searching by many parameters, including 'taxonomic' names, places, and dates. In addition, there is an interface for conducting spatially delimited searches, and another for requesting large 'datasets' via email.

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URL <https://github.com/ropensci/rvertnet>

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

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rvertnet-package	<i>Search VertNet archives using R</i>
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Description

There are a variety of ways to search VertNet

Search by term

Search for `_Aves_` in the state of `_California_`, limit to 10 records, e.g.:

```
searchbyterm(class = "Aves", state = "California", lim = 10, verbose = FALSE)
```

Search for `_Mustela nigripes_` in the states of `_Wyoming_` or `_South Dakota_`, limit to 20 records, e.g.:

```
searchbyterm(genus = "Mustela", specific epithet = "nigripes", state = "(wyoming OR south dakota)", lim = 20, verbose = FALSE)
```

Big data

Specifies a termwise search (like `'searchbyterm()'`), but requests that all available records be made available for download as a tab-delimited text file.

```
bigsearch(genus = "ochotona", rf = "pikaRecords", email = "big@search.luv")
```

Spatial search

```
spatialsearch(lat = 33.529, lon = -105.694, radius = 2000, limit = 10, verbose = FALSE)
```

Full text search

Find records using a global full-text search of VertNet archives.

```
vertsearch(taxon = "aves", state = "california")
```

bigsearch

*Request to download a large number of VertNet records.***Description**

Specifies a term-wise search (like [searchbyterm](#)) and requests that all available records be made available for download as a tab-delimited text file.

Usage

```
bigsearch(specificepithet = NULL, genus = NULL, family = NULL,
  order = NULL, class = NULL, compact = FALSE, year = NULL,
  date = NULL, mappable = NULL, error = NULL, continent = NULL,
  cntry = NULL, stateprovince = NULL, county = NULL, island = NULL,
  igroup = NULL, inst = NULL, id = NULL, catalognumber = NULL,
  collector = NULL, type = NULL, hastypestatus = NULL, media = NULL,
  rank = NULL, tissue = NULL, resource = NULL, rfile, email,
  messages = TRUE, ...)
```

Arguments

specificepithet	(character) Taxonomic specific epithet, e.g. (sapiens in Homo sapiens)
genus	(character) Taxonomic genus
family	(character) Taxonomic family
order	(character) Taxonomic order
class	(character) Taxonomic class
compact	Return a compact data frame (logical)
year	(numeric) Year or range of years designated by comparison operators "<", ">", "<=" or ">=". You can pass in more than one of these queries, in a vector. See example below
date	Event date associated with this occurrence record; yyyy-mm-dd or the range yyyy-mm-dd/yyyy-mm-dd (character)
mappable	Record includes valid coordinates in decimal latitude and decimal longitude (logical)
error	Coordinate uncertainty in meters (numeric) or range of uncertainty values designated by comparison operators "<", ">", "<=" or ">=" (character)
continent	Continent to search for occurrence (character)
cntry	Country to search for occurrence (character)
stateprovince	State or province to search for occurrence (character)
county	County to search for occurrence (character)
island	Island to search for occurrence (character)

igroup	Island group to search for occurrence (character)
inst	Code name for the provider/institution of record (character)
id	Provider's unique identifier for this occurrence record (character)
catalognumber	Provider's catalog number or other ID for this record (character)
collector	Collector name (character)
type	Type of record; "specimen" or "observation" (character)
hastypestatus	Specimen associated with this record is identified as a holotype, paratype, neotype, etc. (character)
media	Record also references associated media, such as a film or video (logical)
rank	TBD (numeric)
tissue	Record is likely to reference tissues (logical)
resource	Identifier for the resource/dataset from which the record was indexed (character)
rfile	A name for the results file that you will download (character). Required.
email	An email address where you can be contacted when your records are ready for download (character). Required.
messages	Print progress and information messages. Default: TRUE
...	Curl arguments passed on to HttpClient

Details

[bigsearch](#) allows you to request records as a tab-delimited text file. This is the best way to access a large number of records, such as when your search results indicate that >1000 records are available. You will be notified by email when your records are ready for download.

Value

Prints messages on progress, but returns NULL

Reading data

We suggest reading data in with `fread()` from the package **data.table** - as it's very fast for the sometimes large datasets you will get from using this function, and is usually robust to formatting issues.

References

<https://github.com/VertNet/webapp/wiki/The-API-search-function>

Examples

```
## Not run:
# replace "big@search.luv" with your own email address
bigsearch(genus = "ochotona", rf = "pikaRecords", email = "big@search.luv")

# Pass in curl options for curl debugging
bigsearch(genus = "ochotona", rfile = "pikaRecords",
```

```

email = "big@search.luv", verbose = TRUE)

# Use more than one year query
bigsearch(class = "aves", year = c(">=1976", "<=1986"),
          rfile = "test-bigsearch1", email = "big@search.luv")

## End(Not run)

```

rvertnet-defunct	<i>Defunct functions in rvertnet</i>
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Description

- [vertavailablemaps](#): Function is now defunct, i.e., not available anymore.
- [vertlocations](#): Function is now defunct, i.e., not available anymore.
- [vertoccurrence](#): Function is now defunct, i.e., not available anymore.
- [vertoccurrencecount](#): Function is now defunct, i.e., not available anymore.
- [vertproviders](#): Function is now defunct, i.e., not available anymore.
- [verttaxa](#): Function is now defunct, i.e., not available anymore.

searchbyterm	<i>Search by term</i>
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Description

Flexible search for records using keywords/terms

Usage

```

searchbyterm(specificepithet = NULL, genus = NULL, family = NULL,
             order = NULL, class = NULL, limit = 1000, compact = TRUE,
             year = NULL, month = NULL, day = NULL, date = NULL, mappable = NULL,
             error = NULL, continent = NULL, cntry = NULL, stateprovince = NULL,
             county = NULL, island = NULL, igroup = NULL, inst = NULL, id = NULL,
             catalognumber = NULL, collector = NULL, type = NULL,
             hastypestatus = NULL, media = NULL, rank = NULL, tissue = NULL,
             resource = NULL, query = NULL, messages = TRUE, only_dwc = TRUE,
             callopts = list())

```

Arguments

specificepithet	(character) Taxonomic specific epithet, e.g. (sapiens in Homo sapiens)
genus	(character) Taxonomic genus
family	(character) Taxonomic family
order	(character) Taxonomic order
class	(character) Taxonomic class
limit	(numeric) Limit on the number of records returned. If >1000 results, we use a cursor internally, but you should still get up to the results you asked for. See also bigsearch to get larger result sets in a text file via email.
compact	Return a compact data frame (logical)
year	(numeric) Year or range of years designated by comparison operators "<", ">", "<=" or ">=". You can pass in more than one of these queries, in a vector. See example below
month	(numeric) month or range of months designated by comparison operators "<", ">", "<=" or ">=". You can pass in more than one of these queries, in a vector. See example below
day	(numeric) day or range of days designated by comparison operators "<", ">", "<=" or ">=". You can pass in more than one of these queries, in a vector. See example below
date	Event date associated with this occurrence record; yyyy-mm-dd or the range yyyy-mm-dd/yyyy-mm-dd (character)
mappable	Record includes valid coordinates in decimal latitude and decimal longitude (logical)
error	Coordinate uncertainty in meters (numeric) or range of uncertainty values designated by comparison operators "<", ">", "<=" or ">=" (character)
continent	Continent to search for occurrence (character)
centry	Country to search for occurrence (character)
stateprovince	State or province to search for occurrence (character)
county	County to search for occurrence (character)
island	Island to search for occurrence (character)
igroup	Island group to search for occurrence (character)
inst	Code name for the provider/institution of record (character)
id	Provider's unique identifier for this occurrence record (character)
catalognumber	Provider's catalog number or other ID for this record (character)
collector	Collector name (character)
type	Type of record; "specimen" or "observation" (character)
hastypestatus	Specimen associated with this record is identified as a holotype, paratype, neotype, etc. (character)
media	Record also references associated media, such as a film or video (logical)

rank	TBD (numeric)
tissue	Record is likely to reference tissues (logical)
resource	Identifier for the resource/dataset from which the record was indexed (character)
query	(character) full text search term(s). not tied to any specific field. This does the same thing as using vertsearch , where this searches for any mention of these terms
messages	Print progress and information messages. Default: TRUE
only_dwc	(logical) whether or not to return only Darwin Core term fields. Default: TRUE
callopts	Curl arguments passed on to HttpClient

Details

[searchbyterm](#) builds a query from input parameters based on Darwin Core (dwc) terms (for the full list of terms, see <https://code.google.com/p/darwincore/wiki/DarwinCoreTerms>).

Value

A data frame of search results

References

<https://github.com/VertNet/webapp/wiki/The-API-search-function>

Examples

```
## Not run:
# Find multiple species
out <- searchbyterm(genus = "ochotona",
  specificipithet = "(princeps OR collaris)", limit=10)

# Specifying a range (in meters) for uncertainty in spatial location
# (use quotes)
out <- searchbyterm(class = "aves", state = "nevada", error = "<25")
out <- searchbyterm(class = "aves", state = "california", year = 1976,
  error = "<=1000")

# Specifying records by event date (use quotes)
out <- searchbyterm(class = "aves", state = "california",
  date = "2009-03-25")
# ...but specifying a date range may not work
out <- searchbyterm(specificipithet = "nigripes",
  date = "1935-09-01/1935-09-30")

# Pass in curl options for curl debugging
out <- searchbyterm(class = "aves", limit = 10,
  callopts = list(verbose = TRUE))

# Use more than one year query
searchbyterm(cgenus = "mustela", specificipithet = "nigripes",
  year = c('>=1900', '<=1940'))
```

```
# full text search - note the URL message
searchbyterm(query = "Mustela nigripes", limit = 50)
searchbyterm(query = "bear", limit = 50)

## End(Not run)
```

spatialsearch	<i>Find records within some distance of a point given latitude and longitude.</i>
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Description

Searches by decimal latitude and longitude to return any occurrence record within the input distance (radius) of the input point.

Usage

```
spatialsearch(lat, long, radius, limit = 1000, compact = TRUE,
  messages = TRUE, ...)
```

Arguments

lat	Latitude of the central point, in decimal degrees (numeric) required.
long	Longitude of the central point, in decimal degrees (numeric) required.
radius	Radius to search, in meters (numeric). There is no default value for this parameter. required.
limit	(numeric) Limit on the number of records returned. If >1000 results, we use a cursor internally, but you should still get up to the results you asked for. See also bigsearch to get larger result sets in a text file via email.
compact	Return a compact data frame (logical)
messages	Print progress and information messages. Default: TRUE
...	Curl arguments passed on to HttpClient

Details

[spatialsearch](#) finds all records of any taxa having decimal lat/long coordinates within a given radius (in meters) of your coordinates.

Value

A data frame of search results

References

<https://github.com/VertNet/webapp/wiki/The-API-search-function>

Examples

```
## Not run:
res <- spatialsearch(lat = 33.529, long = -105.694, radius = 2000,
  limit = 10)

# Pass in curl options for curl debugging
out <- spatialsearch(lat = 33.529, long = -105.694, radius = 2000,
  limit = 10, verbose = TRUE)

## End(Not run)
```

traitsearch	<i>Trait focused search</i>
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Description

Trait focused search

Usage

```
traitsearch(taxon = NULL, has_mass = FALSE, has_length = FALSE,
  has_sex = FALSE, has_lifestage = FALSE, length_type = NULL,
  length = NULL, mass = NULL, limit = 1000, compact = TRUE,
  messages = TRUE, callopts = list(), ...)
```

Arguments

taxon	(character) Taxonomic identifier or other text to search for
has_mass	(logical) limit to records that have mass data (stored in massing). Default: FALSE
has_length	(logical) limit to records that have length data (stored in lengthinmm). Default: FALSE
has_sex	(logical) limit to records that have sex data (stored in sex). Default: FALSE
has_lifestage	(logical) limit to records that have lifestage data (stored in lifestage). Default: FALSE
length_type	(character) length type, one of 'total length', 'standard length', 'snout-vent length', 'head-body length', 'fork length', 'total length range', 'standard length range', 'snout-vent length range', 'head-body length range', 'fork length range'. (stored in lengthtype) Default: NULL
length	(list) list of query terms for length, e.g., "< 100"
mass	(list) list of query terms for mass, e.g., "< 100"
limit	(numeric) Limit on the number of records returned. If >1000 results, we use a cursor internally, but you should still get up to the results you asked for. See also bigsearch to get larger result sets in a text file via email.
compact	Return a compact data frame (boolean)

messages	Print progress and information messages. Default: TRUE
callopts	curl options in a list passed on to HttpClient , see examples
...	(character) Additional search terms. These must be unnamed

Details

Wraps [vertsearch](#), with some of the same parameters, but with additional parameters added to make querying for traits easy.

Value

a list, same as returned by [vertsearch](#), with data in the data slot

Examples

```
## Not run:
traitsearch(has_mass = TRUE, limit = 3)
traitsearch(has_lifestage = TRUE)
traitsearch(has_mass = TRUE, has_length = TRUE)
res <- traitsearch(length_type = "total length",
  length = list(">= 300", "<= 1000"))
summary(as.numeric(res$data$lengthinmm))
res <- traitsearch(has_mass = TRUE, mass = list(">= 20", "<= 500"))
summary(as.numeric(res$data$massing))

traitsearch(taxon = "aves", has_mass = TRUE, limit = 100)

# curl options
traitsearch(has_mass = TRUE, limit = 10, callopts = list(verbose = TRUE))

## End(Not run)
```

vertmap

Make a simple map to visualize VertNet data.

Description

Plots record locations on a world or regional map using latitude/longitude data returned by a VertNet search.

Usage

```
vertmap(input = NULL, mapdatabase = "world", region = ".",
  geom = geom_point, jitter = NULL)
```

Arguments

input	Output from vertsearch , searchbyterm , or spatialsearch . Must include columns "decimallatitude" and "decimallongitude"
mapdatabase	The base map on which your data are displayed; what you choose here determines what you can choose in the region parameter; one of: county, state, usa, world, world2, france, italy, or nz
region	The region in which your data are displayed; to see region names for the "world" database layer, run <code>sort(unique(map_data("world")\$region))</code> after loading packages <code>maps</code> and <code>ggplot2</code> ; to see region names for the US "state" layer, run <code>sort(unique(map_data("state")\$region))</code>
geom	Specifies the type of object being plotted; one of: <code>geom_point</code> or <code>geom_jitter</code> (do not use quotes)
jitter	If <code>geom = geom_jitter</code> , the amount by which to jitter points in width, height, or both. Default

Details

vertmap uses decimal latitude and longitude data in records generated by an `rvertnet` search to display returned records on a specified base map. Taxa are color-coded by scientific name, if available. Adapt the `vertmap` code to construct maps according to your own specifications.

Value

Map of record locations displayed on the selected base map

Examples

```
## Not run:
out <- vertsearch("Junco hyemalis") # get occurrence records
vertmap(out)                       # map occurrence records

# Records are color coded by dwc term "scientificname" - sometimes unavailble
out <- vertsearch("mustela nigripes")
vertmap(input = out, mapdatabase = "state")

# Use searchbyterm() to match records with mapped region
spec <- searchbyterm(genus = "ochotona", specificethet = "princeps", state = "california",
  limit = 200)
vertmap(input = spec, mapdatabase = "state", region = "california")

# Many species
splist <- c("Accipiter erythronemius", "Aix sponsa", "Haliaeetus leucocephalus",
  "Corvus corone", "Threskiornis molucca", "Merops malimbicus")
out <- lapply(splist, function(x) vertsearch(t=x, lim=100))
library("plyr")
out <- ldply(lapply(out, "[", "data"))
vertmap(out)
## jitter points
library("ggplot2")
```

```
vertmap(out, geom = geom_jitter, jitter = position_jitter(1, 6))

## End(Not run)
```

 vertsearch

Find records using a global full-text search of VertNet archives.

Description

Returns any record containing your target text in any field of the record.

Usage

```
vertsearch(taxon = NULL, ..., limit = 1000, compact = TRUE,
           messages = TRUE, only_dwc = TRUE, callopts = list())
```

Arguments

taxon	(character) Taxonomic identifier or other text to search for
...	(character) Additional search terms. These must be unnamed
limit	(numeric) Limit on the number of records returned. If >1000 results, we use a cursor internally, but you should still get up to the results you asked for. See also bigsearch to get larger result sets in a text file via email.
compact	Return a compact data frame (boolean)
messages	Print progress and information messages. Default: TRUE
only_dwc	(logical) whether or not to return only Darwin Core term fields. Default: TRUE
callopts	curl options in a list passed on to HttpClient , see examples

Details

[vertsearch](#) performs a nonspecific search for your input within every record and field of the VertNet archives. For a more specific search, try [searchbyterm](#)

Value

A data frame of search results

References

<https://github.com/VertNet/webapp/wiki/The-API-search-function>

Examples

```
## Not run:
out <- vertsearch(taxon = "aves", "california", limit=3)

# Limit the number of records returned (under 1000)
out <- vertsearch("(kansas state OR KSU)", limit = 200)
# Use bigsearch() to retrieve >1000 records

# Find multiple species using searchbyterm():
# a) returns a specific result
out <- searchbyterm(genus = "mustela", species = "(nivalis OR erminea)")
vertmap(out)

# b) returns a non-specific result
out <- vertsearch(taxon = "(mustela nivalis OR mustela erminea)")
vertmap(out)

# c) returns a non-specific result
splist <- c("mustela nivalis", "mustela erminea")
out <- lapply(splist, function(x) vertsearch(taxon = x, lim = 500))
library("plyr")
out <- ldply(lapply(out, "[[", "data"))
vertmap(out)

# curl options
vertsearch(taxon = "Aves", limit = 10, callopts = list(verbose = TRUE))
# vertsearch(taxon = "Aves", limit = 10, callopts = list(timeout_ms = 10))

## End(Not run)
```

vertsummary

Summarize a set of records downloaded from VertNet.

Description

Creates a simple summary of data returned by a VertNet search.

Usage

```
vertsummary(input, verbose = TRUE)
```

Arguments

input	Output from vertsearch , searchbyterm , or spatialsearch . Required.
verbose	Print progress and information messages. Default: TRUE

Details

[vertsummary](#) provides information on the sources, types and extent of data returned by a VertNet search.

Value

A list of summary statistics

Examples

```
## Not run:
# get occurrence records
recs <- vertsearch("Junco hyemalis", limit = 10)

# summarize occurrence records
vertsummary(recs)

vertsummary(vertsearch("Oncorhynchus clarki henshawi"))

## End(Not run)
```

vert_id	<i>Search by Vertnet occurrence ID</i>
---------	--

Description

Search by Vertnet occurrence ID

Usage

```
vert_id(ids, compact = TRUE, messages = TRUE, ...)
```

Arguments

ids	(character) VertNet IDs, one or more. Required.
compact	(logical) Return a compact data frame. That is, remove empty columns. Default: TRUE
messages	(logical) Print progress and information messages. Default: TRUE
...	Curl arguments passed on to HttpClient

Details

VertNet IDs can be a variety of things, some URIs (i.e., with `http://...`), while others start with `urn`.

Internally in this function we filter data to darwin core terms only. To see what terms we use, do `readLines(system.file("extdata", "simple_dwc_terms.txt", package = "rvertnet"))`.

Get in touch with us if these terms need correcting/are out of date. The terms are from <https://github.com/tdwg/dwc/blob/master>

Value

A list, with data frame of search results, and list of metadata

References

<http://bit.ly/vertnet-wiki>

Examples

```
## Not run:
vert_id(ids = "urn:catalog:CM:Herps:116520")
ids <- c("http://arctos.database.museum/guid/MSB:Mamm:56979?seid=1643089",
        "urn:catalog:CM:Herps:116520",
        "urn:catalog:AUM:Fish:13271")
res <- vert_id(ids)
res$data$occurrenceid

out <- vertsearch(taxon = "aves", state = "california", limit = 5)
(ids <- out$data$occurrenceid)
res <- vert_id(ids)
identical(sort(res$data$occurrenceid), sort(ids))

## End(Not run)
```

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